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a p p e n d i x B

Additional Sources  
and Technical Notes



# a p p e n d i x B

## Additional Sources and Technical Notes

### SECTION 1: COUNTRY OVERVIEW

**Table 1-1**  
**National Population and Labor Force**

#### Canada

National population and labor force: Statistics Canada *Annual Demographics Statistics, Catalogue no. 91-213-XPB*. (Ottawa, Ont.: various years).

Statistics Canada Special tabulations. (Ottawa, Ont.: 1998).

Urban population: Statistics Canada 1996 Census of Population. *A national overview-population and dwelling counts, Catalogue no. 93-357-XPB*. (Ottawa, Ont.: 1997).

*National population:* National population data in this table are based on postcensal population estimates. The estimates are based on data for each province and territory where the base population used to derive postcensal population estimates is the 1991 census count of population by age, sex and marital status adjusted to July 1, 1991, and for net census undercoverage. The postcensal estimates by age, sex and marital status are obtained by the component method. The demographic events that occurred between July 1, 1991, and the reference date of the estimate are added to or subtracted from the July 1, 1991, population. Demographic events can be divided into two groups according to the type of data used: those that data are readily available (births, deaths, marriages, divorces and immigration)

and events that have to be estimated (inter-provincial migration, return of Canadians, emigration, net changes in nonpermanent residents and new widowhood).

*Urban percentages:* Canadian urban and rural population percentages are based on 1996 census counts. Urban and rural data are based on the following definitions. Canadian urban areas have minimum population concentrations of 1,000 and a population density of at least 400 persons per square kilometer, based on the previous census population counts. All territory outside of urban areas is considered rural. Taken together, urban and rural areas cover all of Canada.

*Labor force:* Total labor force refers to the number of Canadians over the age of 15 who are in the labor force, whether they are employed or unemployed. Note that not everyone in the 15-and-over age group is in the labor force. See notes under Tables 2-4 and 2-5 for more detail.

#### Mexico

National and urban population: Instituto Nacional de Estadística, Geografía e Informática. *XI Censo General de Población y Vivienda, 1990. Estados Unidos Mexicanos. Perfil Sociodemográfico*. (Aguascalientes, Ags.: 1992).

Instituto Nacional de Estadística, Geografía e Informática. *Conteo de Población y Vivienda, 1995. Estados Unidos Mexicanos. Resultados Definitivos. Tabulados Básicos*. (Aguascalientes, Ags.: 1996).

Instituto Nacional de Estadística, Geografía e Informática. *Conteo de Población y Vivienda, 1995. Estados Unidos Mexicanos. Perfil Sociodemográfico*. (Aguascalientes, Ags.: 1997).

Instituto Nacional de Estadística, Geografía e Informática. *Encuesta Nacional de la Dinámica Demográfica, 1997*. (Aguascalientes, Ags.: 1997).

**Labor force:** Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Estadística. *Encuesta Nacional de Empleo, 1991, 1995 and 1996*. (Aguascalientes, Ags.: various years).

**National population:** The national population is comprised of Mexican citizens, noncitizen residents who were living in Mexico at the time the census was taken and Mexicans in the diplomatic service. For 1997, data were taken from the *Encuesta Nacional de la Dinámica Demográfica (National Survey on Demographic Dynamics)*. For 1990, 1995 and 1997, there were 0.5, 0.2 and 0.03 million residents who did not give their age. These are included in the category “over 65 years of age.”

**Urban percentages:** The urban population is based on areas with more than 2,500 inhabitants.

**Population density:** Population density was estimated from the country's surface area of 1,967,183 square kilometers, using as the source the *XI Censo de Población y Vivienda, 1990 (XI Population and Household Census, 1990)*.

**Labor force:** Labor force data were estimated from the *Encuesta Nacional de Empleo (National Employment Survey)* for the second quarters of 1991, 1995 and 1996. The estimate was based on the economically active

population, defined as anyone of age 12 or older (*Población Económicamente Activa*, or PEA). The percentage of labor force was calculated using the total population in 1991, 1995 and 1996. The survey, *Encuesta Nacional de Empleo*, is a joint effort of the Instituto Nacional de Estadística, Geografía e Informática and the Secretaría del Trabajo y Previsión Social (Ministry of Labor and Social Welfare) with coverage throughout Mexico.

Labor force data in Table 1-1 differ from labor force data in Table 2-4 because the two tables use different sources. The data in Table 2-4 are derived from estimates of the National Account System of Mexico, and are the number of positions considered as necessary for production. See notes under Table 2-4 for a more complete explanation.

### United States

**National population and age structure:** U.S. Department of Commerce. U.S. Census Bureau. *Statistical Abstract of the United States 1998*. (Washington, DC: 1998). Table Nos. 12 and 14.

**Urban population:** U.S. Department of Commerce. U.S. Census Bureau. *Estimates of the Population of Metropolitan Areas: Annual Time Series, July 1, 1991, to July 1, 1996*. (Washington, DC: 1997).

**Population density:** U.S. Department of Commerce. U.S. Census Bureau. *State Population Estimates: Annual Time Series, July 1, 1990, to July 1, 1998*. (Washington, DC: 1998).

**Labor force:** U.S. Department of Commerce. U.S. Census Bureau and the Bureau of Labor Statistics. *Current Population Survey*. (Washington, DC: 1998).

**National population:** National population figures for the U.S. represent the resident popu-

lation based on the 1990 Census of Population and Housing. Resident population includes all people who usually live within the United States. This excludes the U.S. Armed Forces overseas and civilian U.S. citizens whose usual place of residence is outside the United States. Data include Puerto Rico and U.S. Territories. The following formula was applied to update each group for 1995 and 1996: the 1990 enumeration of resident population, plus births to U.S. resident women, minus deaths to U.S. residents, plus net international migration, and plus net movement of U.S. Armed Forces and civilian citizens to the United States.

*Urban percentages:* Urban percentages are based on U.S. definitions of these areas. In general, an urbanized area comprises one or more places (“central place”) and the adjacent densely settled surrounding territory (“urban fringe”) that together have a minimum of 50,000 persons. Data include Puerto Rico and U.S. territories. The data for 1990 are revised 1990 decennial census figures. The data for 1995 and 1996 are population estimates for those years. These aforementioned estimates incorporate revisions of estimates from previous years and the results of special and test censuses conducted by the U.S. Census Bureau.

*Labor force:* Labor force data represent the U.S. civilian labor force. The civilian labor force includes all U.S. citizens aged 16 and older who have jobs and also includes those without jobs but who are available for work and looking for work. This figure excludes those who work for the U.S. military. The civilian labor force data include Puerto Rico and U.S. Territories.

## **Tables 1-1a, 1-1b and 1-1c**

### **Top Population Centers**

#### **Canada**

Statistics Canada. *Annual Demographics Statistics, Catalogue no. 91-213-XPB*. (Ottawa, Ont.: 1998).

*Metropolitan areas:* The Canadian Census Metropolitan Area (CMA) is a very large urban area (known as an “urban core”) plus adjacent urban and rural areas (known as “urban and rural fringes”) that have a high degree of social and economic integration with the urban core. A CMA has an urban core population of at least 100,000, based on the previous census. Once an area becomes a CMA, it is retained as a CMA even if the population of its urban core declines below 100,000. All CMAs are subdivided into census tracts. A CMA may be consolidated with adjacent census agglomerations (CAs) if they are socially and economically integrated.

#### **Mexico**

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Contabilidad Nacional, Estudios Socioeconómicos y Precios. *Estadísticas del Medio Ambiente, 1997*. (Aguascalientes, Ags.: 1998).

*Metropolitan areas:* The table lists the number of people living in the most densely populated areas; these include metropolitan areas, metropolitan zones and cities. By definition a metropolitan area (MA) is formed when two or more urban sites or cities (located in different municipalities or states) grow to the point where they have physically merged, to form a continuous population concentration of 100,000 inhabitants or more. A metropolitan zone (MZ) includes the MA, plus the municipalities to which the components of the MA belong. The other geo-

graphical locations in Table 1-1b are cities with populations of 15,000 or more. They do not meet the definition of Metropolitan Zones or Areas.

### United States

U.S. Department of Commerce. U.S. Census Bureau. *Statistical Abstract of the United States 1998*. (Washington, DC: 1998).

*Metropolitan areas:* The United States defines Metropolitan Statistical Areas (MSAs) as a core area with a large population (usually 50,000 or more) together with adjacent communities having a high degree of social and economic integration. If an MSA has a population of more than 1 million, with separate component areas, it is designated a Consolidated Metropolitan Statistical Area (CMSA) with the components designated as Primary Metropolitan Statistical Areas (PMSA). For instance the Los Angeles-Riverside-Orange County, CA CMSA is made up of the Los-Angeles-Long Beach PMSA, the Orange County PMSA, the Riverside-San Bernardino PMSA and the Ventura PMSA.

**Table 1-2**  
**Area**

### Canada

Natural Resources Canada. GeoAccess Division. (Ottawa, Ont.: 1998).

*Land and water area:* The official source of Canada's land and water area is the GeoAccess Division of Canada Centre for Remote Sensing in Natural Resources Canada (NRCan). Area data were calculated in 1981 using planimeters on large-scale maps (scale of 1: 250 000). GeoAccess produces the *National Atlas of Canada*, which contains various types of maps showing the extent of Canada's land and water area. Water data in-

clude inland waters, Great Lakes waters and coastal waters, but do not include offshore waters such as fishing zones, internal salt waters and territorial seas. (Canada has legal jurisdiction over a very large area of offshore waters. The Canadian Hydrographic Service of Fisheries and Oceans Canada has determined the total extent of these waters to be 5.9 million square kilometers.) Canada is the second largest country in the world, with a total area (land plus freshwater) of 10 million square kilometers. Located primarily above the 49th parallel of latitude, Canada borders on three oceans, the Atlantic to the east, Arctic to the north and Pacific to the west.

### Mexico

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Geografía. (Aguascalientes, Agu.: 1998).

*Land and water area:* Data come from semi-automatic digital measurements, which provide accurate values for land area. Water area represents inland waters (such as ponds, bays, inlets, lagoons, marshes, etc.), coastal waters (provided their geography conforms to the International Agreement on Maritime Territory (inlet less than 24 nautical miles; i.e., less than 44.448 km)) and territorial seas (waters within 12 nautical miles of the Mexican shoreline). Data for water area also include islands (5,127 square km) and maritime territory (209,000 square km).

### United States

U.S. Department of Commerce. U.S. Census Bureau. *Statistical Abstract of the United States 1998*. (Washington, DC: 1998). Table No. 387.

*Land and water area:* U.S. land and water areas are defined by the TIGER (Topologically Integrated Geographic Encoding and Refer-

encing) database maintained at the Census Bureau. The water data represent the total of four major water classifications: inland water (all lakes ponds, rivers, streams, creeks or similar bodies of water with the exception of the Great Lakes); coastal water (major bays and nonenclosed areas); territorial seas (water located within 3-nautical miles of the U.S. shoreline); and Great Lakes water (includes the five Great Lakes, Lake St. Clair and the St. Lawrence Seaway). Area data for U.S. territories can be found in Table 387 of the 1998 *Statistical Abstract of the United States*.

**Table 1-3**  
**Gross Domestic Product by Industry**  
(Current U.S. dollars)

**All Countries**

*Gross domestic product:* Gross domestic product (GDP) is an aggregate measure of output of goods and services produced by factors, including land, labor and capital, located in a particular country. As the most widely-used aggregate indicator of the size of a country's economy, GDP measures the total value of goods and services produced in a given period minus the total cost of goods and services used as intermediate inputs. For an industry, the difference between the total output and the total intermediate input is the industry's total value added. Therefore, GDP is the sum of all industries' value added or GDP by industry. GDP by industry shows how much of the total GDP was created in each industry.

There are several different valuation approaches to measuring the GDP by industry. For example, factor cost valuation represents the earnings of the factors of production and is measured by the costs of labor (wages and

salaries, supplementary labor income) and capital inputs (mixed income and other operating surplus) in the production process. The market price approach brings the valuation of production up to the "market price" level. In order to derive the measure of GDP at market prices for the total economy, net indirect taxes (i.e., indirect taxes less subsidies) should also be added to the measure of GDP at factor cost as they are part of the market price of goods and services. The indirect taxes include taxes on production such as payroll and property taxes and taxes on products such as sales tax. In Table 1-3, the United States and Mexico estimates are based on market price evaluation. The Canadian estimates are based on an evaluation, which includes net indirect taxes paid on production and sales taxes paid by industries. The difference is that sales taxes collected by industries but paid by end users are not included in the Canadian estimates.

The industry categories included in Table 1-3 are broad aggregates for economic activity by industry. The industry categories included in Table 1-3 are a modified version of the 1987, U.S. Standard Industry Classification (S.I.C.). At this level, these categories are generally comparable across the three countries. However, there are instances where modifications and recategorization of individual country data have occurred. These are explained in the individual country notes.

In general, however, the following definitions, of these industries are as follows: *Agriculture, forestry and fishing* includes agricultural and related service industries, fishing and trapping industries and logging and forestry industries. *Mining* includes mining, quarrying and oil well industries. *Construction* includes construction industries. *Manufacturing* includes manufacturing industries. *Com-*

*munications* include communication and related service industries. *Utilities* include electricity, natural gas, water, sanitation and other utility services. *Wholesale trade* includes wholesale trade industries. *Retail trade* includes retail trade industries. *Finance, insurance and real estate* includes finance, insurance and real estate industries. *Services* includes business service industries, education service industries, health and social service industries, accommodation, food and beverage industries, other service industries and nonprofit institutions serving households.

The industry subcategories under *Transportation* are based on the following definitions. *Railroad* transportation includes rail transportation and related service industries. *Local and Interurban Passenger* includes mass transit transportation (both transit rail and bus), interurban and rural transit, taxicab, school and other bus operations, and other related industries. *Trucking, Warehousing and Storage* include truck transportation industries and other storage and warehousing industries. *Water* includes water transportation and related service industries. *Air* includes air transportation and related service industries. *Pipelines, excluding natural gas* includes crude oil and other pipeline transport industries. *Transportation services* includes other incidental service industries such as services of travel agencies, tour operators, freight forwarders and brokers, rental services and other miscellaneous transportation services.

### **Canada**

Statistics Canada. Input-Output Division. Special tabulations. (Ottawa, Ont.: 1999).

In order to derive the measure of Canada's GDP by industry cost for the total Canadian

economy, net indirect taxes (i.e., indirect taxes less subsidies) paid by industries were added to the measure of GDP at factor cost. The "net indirect taxes," in this case, indicate that subsidies have been subtracted from the indirect tax total.

The industry categories included in Table 1-3 are broad aggregates for economic activity by industry. The industry categories included in Table 1-3 are a modified version of the 1987, U.S. Standard Industry Classification (S.I.C.). Canadian data included in Table 1-3 are, for the most part, based on Canada's 1980 Standard Industrial Classification (SIC-80) with the one exception being the category of government, which includes all nonprofit government-funded activity (regardless of industrial activity). Agriculture, forestry and fishing include: agricultural and related services industries, fishing and trapping industries and logging and forestry industries. Transportation industries include related services for railroad, water, air and transportation services. Trucking, warehousing and storage includes other warehousing and storage industries. Utilities include natural gas pipeline transport. Services include: business service industries, accommodations, food and beverage industries, other service industries and private and nonprofit institutions servicing households.

### **Mexico**

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Contabilidad Nacional, Estudios Socioeconómicos y Precios. *Sistema de Cuentas Nacionales de México, 1988-1996*. (Aguascalientes, Ags.: 1997).

The base year for the *Sistema de Cuentas Nacionales de México* (Mexico's National Account System) is 1993, based on the United Nation's framework for national accounts. This



framework resulted from a joint effort of the European States Commission (EUROSTAT), the International Monetary Fund (IMF), the Organization for Economic Cooperation and Development (OECD) and the World Bank. The classification scheme used in Table 1-3 does not match exactly with that of the *Sistema de Cuentas Nacionales de México*, since some adjustments were made for comparability purpose across the three countries. The following adjustments were made:

Transportation in this table is based on the industry category of “Transportation, Warehousing and Communications” in the *Sistema de Cuentas Nacionales de México*. (Specifically, “transportation, warehousing and communications” is considered Gran Division 7, or GD 7 in the *Sistema de Cuentas Nacionales de México*.) However, for Table 1-3, the Transportation and Warehousing categories have been separated from Communications. Under the category “Transportation Services” in Table 1-3, the following were included: customs agencies, travel agencies, parking lots, hauling and weighing services and other transportation related services such as management of ports, airports and bus stations, coordination of roads and toll booths, control of radar and flight stations and the unloading and stowing of goods. The data for the category “Utilities” in Table 1-3 are based on Mexico’s Gran Division 5 (GD 5) in its *Sistema de Cuentas Nacionales de México*, and include the following industries: electricity, natural gas and water. The data for the category “Services” in Table 1-3 are based on Mexico’s Gran Division 6 (GD 6) in its *Sistema de Cuentas Nacionales de México*, and include the following industries: professional services such as schooling, health care, recreational and others. Restaurants and hotels

also were included in the data for the “Services” category in Table 1-3. In Mexico’s *Sistema de Cuentas Nacionales de México*, restaurants and hotels would usually be counted in the category of “Commerce.”

### United States

U.S. Department of Commerce. Bureau of Economic Analysis. *Survey of Current Business*. (Washington, DC: August 1996 and November 1999).

U.S. GDP data by industry in Table 1-3 are measured at market price, which includes factor cost and net indirect taxes. The industry classification and definition used in this table for the United States are generally based on the U.S. 1987 Standard Industrial Classification (SIC). However, some regroupings have been done for the sake of comparison. One regrouping has been done for transportation, communications and utilities, which are classified in Division E in the 1987 SIC. *Utilities* include electric, natural gas, sanitation and other miscellaneous utility services. The *Commerce* subcategory represents a combining of the U.S. SIC Division F for wholesale trade and Division G for retail trade. Starting in 1996, the Bureau of Labor Statistics reclassified some of the multimodal courier services from trucking to the air transportation industry. It was not possible to reclassify data for previous years. Therefore, the decrease in the trucking, warehousing and storage industry between 1995 and 1996 is reflective of a change in the data time series rather than an actual decrease in this industry. More detailed explanations can be found in the *Standard Industrial Classification Manual 1987* (U.S. Office of Management and Budget, Washington, DC).

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## SECTION 2: TRANSPORTATION AND THE ECONOMY

### Tables 2-1

#### Gross Domestic Product (GDP)

#### Attributed to Transportation-Related Final Demand

(Current U.S. dollars)

##### All Countries

Transportation-related final demand is the sum of all consumer and government expenditures for transportation purposes, plus the value of goods and services purchased by businesses as investment for transportation purposes. It measures the importance of transportation from a demand perspective. Since it includes only expenditures on the final products of an economy, transportation-related final demand is comparable to Gross Domestic Product.

##### Canada

Statistics Canada. Input-Output Division. Special tabulations. (Ottawa, Ont.: 1998).

See notes for Table 1-3. Canadian data are based on Canada's 1980 Standard Industrial Classification (SIC-80). However, a number of Canadian industry classifications were regrouped for the purposes of this table. The category "gross private domestic investment" in Table 2-1 excludes investment in telecommunication structures.

##### Mexico

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Contabilidad Nacional, Estudios Socioeconómicos y Precios. *Sistema de Cuentas Nacionales de México, 1988-1996*. (Aguascalientes, Agu: 1997).

See notes for Table 1-3. Mexican data are based on Mexico's 1993 *Sistema de Cuentas*

*Nacionales de México* (Mexico's National Account System), for which the base year is 1993. However, a number of Mexican industry classifications were regrouped for the purposes of this table.

##### United States

Data used in this Table 2-1 are compiled by the Bureau of Transportation Statistics (BTS) based on the U.S. National Income and Product Accounts. This table is based on the following primary sources:

1990: U.S. Department of Commerce. Bureau of Economic Analysis. *Historical Data Tables*. (Washington, DC: 1990).

1995, 1996: U.S. Department of Commerce. Bureau of Economic Analysis (BEA). *Survey of Current Business*, August 1998, (Tables 2.6, 3.10, 4.3, 5.6, 5.8 and p.148); October 1998, (Tables 3.16 and 3.17), and special tabulations based on BEA's underlying statistical details. (Washington, DC: 1998).

*Personal consumption of transportation, total*: Road motor vehicles consist of new autos, used autos and other road motor vehicles such as new trucks and used trucks. Motor vehicles used primarily for recreation, boats, noncommercial trailers and aircraft are excluded. Road motor vehicle parts include tires, tubes, accessories and other parts. Motorcycles and other include motorcycles and bicycles. Transportation services include repair, greasing, washing, parking, storage, rental, leasing, tolls, insurance, purchased local and intercity transportation services. Motor fuel and lubricants include gasoline (all types) and oil used for autos, trucks, airplanes, motorcycles and boats. Details on airplane and boat shares are not available. A more detailed description of these items is provided in the technical notes for Table 2-2.

*Gross private domestic investment, total:* Transportation structures include railroads and petroleum pipelines. Transportation equipment consists of trucks, buses, truck trailers, autos, aircraft, ships and boats and railroad equipment.

*Exports/imports, total:* Goods and services that are counted as part of exports/imports include civilian aircraft, engines and parts; road motor vehicles, engines and parts; passenger fares, (including the receipts/payments of U.S./foreign air and ocean/cruise carriers for the transportation of non-U.S. residents/U.S. residents between the United States and foreign countries or between two foreign points) and other transportation. The total for road motor vehicle, engines and parts excludes boats, aircraft and noncommercial trailers. Other transportation includes the freight revenues of U.S./foreign-operated ocean, air and other carriers (such as rail, pipeline and Great Lakes shipping) for international transport of U.S. exports/imports and for the transportation of foreign freight between foreign points; port expenditure receipts (representing payments for goods and services purchased in the United States/foreign countries by foreign-operated/U.S. carriers); and receipts/payments of U.S./foreign owners from foreign operators for the charter of vessels and rental of freight cars and containers.

*Government transportation-related purchases, total:* Government purchases represent the sum of consumption expenditures and gross investment. Government purchases include federal, state and local purchases of transportation services of roads, water, air, railroad and transit. Government expenditures on transportation-related structures and equipment also are included. Defense related purchases include expenditures on

transportation of materials (care and movement of goods by water, rail, truck and air), the rental of trucks and other transportation equipment and warehousing fees, and travel of persons (care and movement of Department of Defense military and civilian employees), including tickets for all modes of travel, per diem, taxi fares, automobile rental and mileage allowances for privately owned vehicles.

**Table 2-2**  
**Personal Consumption Expenditures**  
**on Transportation by Subcategory of**  
**Expenditure**

(Current U.S. dollars)

**All Countries**

Personal consumption expenditures for transportation in Table 2-2 are conceptually the same as those that are included in Table 2-1. This table presents the same information with more detail, organized into different categories. Note that expenditures for freight shipments are not included in the U.S. and Mexican consumption data. However, expenditures for freight shipments by rail and intercity bus are included in Canadian data.

**Canada**

Statistics Canada. Input-Output Division. Special tabulations. (Ottawa, Ont.: 1998).

See notes for Table 1-3. Canadian data are based on Canada's 1980 Standard Industrial Classification (SIC-80). However, a number of Canadian industry classifications were regrouped for the purposes of this table. Data in Table 2-2 reflect personal consumption expenditures by Canadian residents both in Canada and in foreign countries. Personal expenditures in Canada by foreigners are excluded.

## Mexico

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Contabilidad Nacional, Estudios Socioeconómicos y Precios. *Sistema de Cuentas Nacionales de México, 1988-1996*. (Aguascalientes, Agu: 1997).

See notes for Table 1-3. Mexican data are based on Mexico's 1993 *Sistema de Cuentas Nacionales de México* (Mexico's National Account System), for which the base year is 1993. However, a number of Mexican industry classifications were regrouped for the purposes of this table.

## United States

Data used in Table 2-2 are compiled by the Bureau of Transportation Statistics (BTS) based on the U.S. National Income and Product Accounts. This table is based on the following primary sources:

1990: U.S. Department of Commerce. Bureau of Economic Analysis (BEA). *Historical Data Tables*. (Washington, DC: 1990).

1995, 1996: U.S. Department of Commerce. Bureau of Economic Analysis (BEA). *Survey of Current Business*, August 1998, Tables 2.4 and special tabulations based on BEA's underlying statistical details. (Washington, DC: 1998).

*User-operated transportation, total*: Combined as a whole, the categories for new and used passenger cars; new and used trucks; and parts and accessories of road motor vehicles correspond to the entry for road motor vehicles and parts in Table 2-1. As in Table 2-1, motor vehicles used primarily for recreation such as recreational boats, noncommercial trailers and aircraft are excluded from Table 2-2.

Data for new cars and trucks represent the number of units sold multiplied by the average retail list price, adjusted for discounts, sales taxes and transportation costs. Data for used cars and trucks represent the sum of profit margins that dealers make from selling used cars and trucks to nonbusiness buyers, plus adjustments for changes in the stock of used cars and trucks. Reimbursements to employees who purchase used cars for business or mixed-purpose uses, also are added. Reimbursements to employees who purchase used trucks for business or mixed-purpose uses are not included.

New and used motorcycles and other motor vehicles include motorcycles and bicycles. Parts and accessories of road motor vehicles consist of tires, tubes, accessories and other parts. Repair and rental include: (1) automotive repair shops, passenger car rental and leasing establishments, and other automotive service establishments; (2) gasoline service stations and other retail establishments handling motor vehicle repair and rental and leasing and (3) repair services by franchised car and truck dealers. Motor fuel (gasoline and diesel) and lubricants also include coolant and other products. Tolls consist of bridge, tunnel, ferry and road tolls. Insurance consists of premiums, less benefits and dividends, for motor vehicle insurance.

*Purchased intercity/local and suburban transportation*: The other category for purchased intercity transportation consists of baggage charges, coastal and inland waterway fares, travel agents' fees and airport bus fares. The mass transit category of local and suburban transportation consists of both transit rail and bus services.

**Table 2-3**  
**Government Expenditures for**  
**Transportation by Mode**

(Current U.S. dollars)

### Canada

Statistics Canada. Public Institutions Division. Special tabulations. (Ottawa, Ont.: 1999).

*Data coverage:* Data for government expenditures in this table reflect outlays for all phases of the acquisition, construction, operation and maintenance of the relevant transportation facilities and equipment as well as expenditures pertaining to related engineering and technical surveys. This function now includes the government transfers to its own business enterprises engaged in the transportation activities, especially public transit and railway services.

*Air:* Data reflect expenditures for navigational, air traffic and other related services, operating subsidy payments to regional air carriers and municipal airports, grants to flying clubs and payments for international air navigational services. At the provincial level, data include assistance to the aviation industry, municipal airports and other related services. At the local level, data include outlays related to municipal airports.

*Water transport:* Data reflect expenditures on development, maintenance, operation and control of navigational channels, canals, harbor and wharf facilities, ferries that do not form integral part of road systems, landings and other marine facilities. It also includes the costs of the related operations of the Coast Guard and certain northern transportation services.

*Pipeline, oil and gas:* Data reflect expenditures on the operation, construction, use and

maintenance of pipeline as well as grants and contributions to support the operation, construction and maintenance of pipeline systems.

*Rail:* Data reflect expenditures on the development, implementation and monitoring of policies and programs related to railway network rationalization and effectiveness. Rail data also include payments for railway relocation, contributions to railway passenger services infrastructure and to freight movements in certain geographical regions as well as grants for operations of railway facilities to resource areas.

*Road:* Data reflect expenditures on highways, secondary roads, roads to resource areas, boulevards, avenues and streets together with related storm sewers (where separated from sanitary sewers). Bridges, over and underpasses and road tunnels incorporated in highways also are included as well as those ferries that are usually operated by highway departments and form integral parts of road systems. Such ferries are distinguished from major lake and seagoing vessels and their supporting operations, which (if not classified as business enterprises), are assigned to the "water transport" category. The road data also include the costs of removing snow, debris, leaves and other deposits as well as surface sanding and flushing, expenses pertaining to traffic control and parking facilities.

### Mexico

1990: Secretaría de Programación y Presupuesto. *Cuenta de la Hacienda Pública Federal, 1990.* (Mexico City, D.F.: 1991).

1995 and 1996: Secretaría de Hacienda y Crédito Público. *Cuenta de la Hacienda Pública Federal, 1995 y 1996.* (Mexico City, D.F.: 1996 and 1997).

*Rail:* Prior to 1996, freight and passenger railroad transportation services were provided by a single decentralized public agency. Expenditures for passenger services are included in freight services, but the amount is not significant. The decrease in expenditures was due to a reduction in public investment and to a significant and gradual reduction since 1991 of operational personnel by the Ferrocarriles Nacionales de México. This reduction was part of the preparation by the Ferrocarriles Nacionales de México for the transfer of rail service to the private sector. The first part of the transfer took place in December 1996. In addition, the intensive economic contraction of Mexico in 1995 caused a drop in public expenditures.

### **United States**

U.S. Department of Transportation. Bureau of Transportation Statistics. Special Tabulations. (Washington, DC: 1999) Based on the following primary sources:

1990: U.S. Department of Commerce. U.S. Census Bureau. *Government Finances: 1989-90*. (Washington, DC: 1990).

1995 and 1996: U.S. Department of Commerce. U.S. Census Bureau. Web site: [www.census.gov/govs](http://www.census.gov/govs)

All years, rail and pipeline: U.S. Department of Transportation, Bureau of Transportation Statistics. *Government Transportation Financial Statistics*. (Washington, DC: 1997).

Data for government expenditures in Table 2-3 refer to local, state and Federal Government in the United States. There are different sources of government expenditure data. For example, government accounts in the U.S. national account system, provide data on government consumption and gross investment. The publication, *Government Trans-*

*portation Financial Statistics* of the U.S. Bureau of Transportation Statistics, has extensive data on government expenditures on transportation. Table 2-3 uses the same sources as the *Government Transportation Financial Statistics* report, but the data are organized differently and include more original details from the primary data source, the *Annual Survey of Government Finances*, conducted by the U.S. Census Bureau.

The *Annual Survey of Government Finances* covers the entire range of government finance activities, including revenues, expenditures, debt and assets. This table is based on government expenditure data. Government expenditures are all direct expenditures, or direct expenditures by federal, state or local governments. (Intergovernmental transfers such as federal to state grants where funding is directly expended at the state level are only counted once.). Infrastructure expenditures include those for production of fixed works and structures and additions, replacements and major alterations. Equipment expenditures include those for purchase of equipment and for payments on capital leases. In some cases, purchase of land and existing structures also are included because data do not allow their separation. Expenditures on current operations include those for compensation of officers and employees and for supplies, materials, operating leases and contractual services. Data for pipelines and railroads are from *Government Transportation Financial Statistics* of the U.S. Bureau of Transportation Statistics, since the census does not provide any data on these modes.

For 1995, 1995 data for state and local governments and 1992 data for the Federal Government are included. For 1996, 1996 data for state governments, 1995 data for local

governments and 1992 data for the Federal Government are included. More recent federal data were not available during the research phase of this project. All data are on fiscal year basis (for example, fiscal year 1996 represents October 1, 1995, through September 30, 1996).

**Table 2-4**  
**Employment in Transportation and Related Industries**

**All Countries**

Employment by industry groups provides employment information according to the primary nature of a business. Table 2-4 shows how many people (based on the number of employees) worked in industries with transportation and related activities as their primary business. U.S. and Canadian data are based on the number of employees. Mexican data are based on the number of full-time employment positions.

**Canada**

Statistics Canada. *Employment, Earnings and Hours—Payrolls and Hours, Catalogue no. 72-002-XPB*. (Ottawa, Ont.: various years).

Statistics Canada. *Passenger Bus and Urban Transit Statistics, Catalogue no. 53-215-XPB*. (Ottawa, Ont.: various years).

Statistics Canada. Special tabulations. (Ottawa, Ont.: 1998).

Transport Canada. *Transportation in Canada 1997—Annual Report*. (Ottawa, Ont.: 1998).

*Data source:* The monthly Statistics Canada, *Survey of Employment, Payrolls and Hours* (SEPH), is designed to provide monthly estimates to measure levels and month-to-month trends in employment by industry. The data are compiled for the payroll employment,

payrolls and hours from which different variables such as employment, average weekly and hourly earnings and average weekly hours, for Canada, provinces and territories at detailed industrial levels, are derived. The target population is composed of all employers in Canada, except those primarily involved in agriculture, fishing and trapping, private household services, religious organizations and defense services.

The SEPH draws its sample from the Business Register (BR) and from a list of all payroll deduction accounts maintained by Revenue Canada. The Business Register is a list of all businesses in Canada and is updated each month using data from various surveys, business profiling and administrative data maintained by the Business Register Division of Statistics Canada. The payroll deduction source represents all employers with remittances for employee income taxes, Canada/Québec Pension Plan and employment insurance contributions. The survey methodology is based on a census of establishments within an enterprise with a complex structure having more than 300 employees and on sample data from establishments within an enterprise with a simple or with complex structure having less than 300 employees. Data represent annual averages that are weighted and refer to 1 week out of each month.

*Industry employment categories:* Industries are defined at the three-digit level of Canada's Standard Industry Classification (SIC) of 1980. For comparability with Mexican and U.S. data, employment categories may have been rearranged and terminology may be different. For categories under *Local and Inter-urban Passenger*, data were obtained from the four-digit SIC 80 level from transportation surveys.

*Employed labor force:* Employed labor force figures in Table 2-4 differ from those in Tables 1-1 and 2-5. National labor force figures in this table represent the total employed civilian labor force. This figure differs from the data for Canadian labor force in Table 1-1 because it includes only those that are currently employed among the civilian Canadian labor force. In contrast, the data in Table 1-1 represent those individuals in the civilian labor force that are both employed and unemployed. Data for the employed labor force in Table 2-4 also differ from the data for employed labor force in Table 2-5. This is because Table 2-4 is based on one survey, the SEPH, while Table 2-5 is based on a different survey, the Labor Force Survey (LFS). The SEPH is based on a business survey of Canadian employers while the LFS is based on a household survey. Because of this and other methodological differences, the total for employed labor force differs between Table 2-4 and 2-5. For additional information, call the SEPH inquiry line at (613) 951-4090 or the Labor Statistics Division of Statistics Canada at (613) 951-4168.

### **Mexico**

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Contabilidad Nacional, Estudios Socioeconómicos y Precios. *Sistema de Cuentas Nacionales de México, 1988-1996*. (Aguascalientes, Agu.: 1997).

Poder Ejecutivo Federal. *Informe de Gobierno*, various years. (Mexico City, D.F.: various years).

*Data source:* Data are a simple average of the 12-month period and are not a count of the number of people employed in economic activities, but rather an estimate of the number of positions required by each economic activity to carry out its economic production.

*Employed labor force:* Labor force data in this table do not agree with that of Table 1-1 (National Population and Labor Force) because the data sources for the two tables differ in their objectives and methodologies. Data in Table 1-1 are from the *Encuesta Nacional de Empleo (National Employment Survey)*, and represent the “población económicamente activa” (economically active population). (The economically active population is anyone 12 years of age or older.) Data for employed labor force in Table 2-4 are from the *Sistema de Cuentas Nacionales de México* (National Account System of Mexico) and refer to the number of people employed and under payroll.

### **United States**

Data used in Table 2-4 are compiled by the Bureau of Transportation Statistics (BTS) based on employment data from the Bureau of Labor Statistics and other sources. This table is based on the following primary sources:

Employed labor force, total: U.S. Department of Labor. Bureau of Labor Statistics. *Household Data Annual Averages. 1998*. Table 1. (available at BLS web site: [www.stats.bls.gov](http://www.stats.bls.gov))

Private Employment (Transport Sectors, Transportation Vehicle and Equipment Manufacturing and Related Industries):

1990, 1995: U.S. Department of Transportation, Bureau of Transportation Statistics, special tabulation based on data from U.S. Department of Labor. Bureau of Labor Statistics. *National Employment, Hours and Earnings, United States, 1988-1996*. (Washington, DC: various years). SIC 45.

1996: U.S. Department of Transportation, Bureau of Transportation Statistics, special tabulation based on data from U.S. Depart-



ment of Labor. Bureau of Labor Statistics. *National Employment, Hours and Earnings, United States, June 1997*. (Washington, DC: 1997). Table B-12.

#### Government employment:

##### *Federal:*

1990, 1995: U.S. Department of Transportation. Office of the Secretary. *DOT Employment Facts, A Report to Management*. (Washington, DC: various years).

1996: U.S. Department of Transportation. Office of the Secretary. *DOT Workforce Facts*, October 1, 1995 through September 30, 1996. (Washington, DC: 1997).

##### *State and local:*

1990: U.S. Department of Commerce. U.S. Census Bureau. *Statistical Abstract of the United States, 1998*. (Washington, DC: 1998). Table 531.

*Data source:* Employment by industry data are from the *National Employment, Hours, and Earnings* published by the Bureau of Labor Statistics (BLS), U.S. Department of Labor, which is a product of the *Current Employment Statistics* (CES) or establishment survey program. The CES is a monthly survey conducted by state employment security agencies in cooperation with the BLS. The survey provides employment, hours and earnings estimates based on payroll records of business establishments. Data represent annual employment averages, which are arithmetic averages of the 12 monthly estimates for a particular year.

The Bureau of Labor Statistics (BLS) does not publish data reliability information along with estimates. Instead, it provides estimation formulas and the necessary parameters so that users can estimate standard errors

for estimates of their interest. For additional information, see the “Explanatory Notes and Estimates of Error” in the BLS monthly publication *Employment and Earnings*.

*Industry categories:* School bus employment data do not include drivers employed by school districts. Transportation services in this table largely include services industries involved in arranging passenger and freight transportation, such as travel agencies and freight forwarders. The category of other transportation equipment includes motorcycles, bicycles, tanks and tank components. Federal Department of Transportation employment represents full and part-time civilian and Coast Guard employees. State and local government employment represents highway employment only.

*Employed labor force:* National labor force figures in this table represent the total employed civilian labor force. This figure differs from the data for U.S. labor force in Table 1-1 because it includes only those that are currently employed among the civilian U.S. labor force. In contrast, the data in Table 1-1 represent those individuals in the civilian labor force that are both employed and unemployed.

### **Table 2-5** **Employment in Transportation-Related Occupations**

#### **All Countries**

Employment by occupation groups provides employment information according to the nature of a particular job. For example, since truck driving is a transportation activity, a truck driver employed by a retail company (such as a grocery store) is counted in the employment of transportation occupations, but *is not* counted in the employment of trans-

portation industries (because a retail company such as a grocery store is not considered part of the transportation sector.)

Table 2-5 shows how many people (employees) worked in positions unique to transportation such as a truck driver, throughout the economy, including transportation and nontransportation industries. U.S. and Canadian data are based on the number of employees. Mexican data are based on the number of employment positions.

### Canada

Statistics Canada. *Historical labor force statistics, Catalogue no. 71-201-XPB*. (Ottawa, Ont.: various years).

Statistics Canada. Special tabulations. (Ottawa, Ont.: 1998).

*Data source:* The Statistics Canada *Labor Force Survey (LFS)* is a household survey carried out monthly by Statistics Canada. The objectives of the LFS are to divide the working-age population into three mutually exclusive classifications (employed, unemployed and not in the labor force) and provide description and explanatory data on each of these categories. Data from the survey provide information on major labor market trends such as shifts in employment across industrial sectors, hours worked, labor force participation and unemployment rates.

On a monthly basis, the LFS surveys a sample of individuals who are representative of the civilian, noninstitutional population 15 years of age or older in Canada's ten provinces. Specifically excluded from the survey's coverage are residents of the Yukon and Northwest Territories, persons living on Indian Reserves, full-time members of the Canadian armed forces and inmates of institutions. These

groups together represent an exclusion of approximately 2 percent of the population aged 15 or older. Data represent annual averages that are weighted and refer to 1 week out of each month.

*Occupation categories:* Employment categories are based on Canada's 1980 Standard Occupation Classification (SOC). For comparability with Mexican and U.S. data, employment categories may be rearranged and terminology may be different.

*Employed labor force:* Employed labor force figures in Table 2-5 differ from those in Tables 1-1 and 2-4. National labor force figures in this table represent the total employed civilian labor force. This figure differs from the data for Canadian labor force in Table 1-1 because it includes only those that are currently employed among the civilian Canadian labor force. In contrast, the data in Table 1-1 represent those individuals in the civilian labor force that are both employed and unemployed. Data for the employed labor force in Table 2-5 also differ from the data for employed labor force in Table 2-4. This is because Table 2-5 is based on one survey, the LFS, while Table 2-4 is based on a different survey, the Survey of Employment, Payrolls and Hours (SEPH). The LFS is based on a household survey while the SEPH is based on business survey of Canadian employers. Because of this and other methodological differences, the total for employed labor force differs between Table 2-5 and 2-4. For additional information, call the LFS inquiry line at (613) 951-4090 or the Labor Statistics Division at Statistics Canada at (613) 951-4168.

### Mexico

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Contabilidad

Nacional, Estudios Socioeconómicos y Precios. *Sistema de Cuentas Nacionales de México, 1988-1996*. (Mexico City, D.F.: 1997).

Also see notes for Table 2-4 for employed labor force. Data on transportation employment by occupation are nonexistent, except for taxi cab drivers and chauffeurs.

### United States

Data used in this table are compiled by the Bureau of Transportation Statistics (BTS) based on employment data from the Bureau of Labor Statistics. This table is based on the following primary sources:

U.S. Department of Labor. Bureau of Labor Statistics. *Household Data Annual Averages*. Table 1. (Available at BLS web site: stats.bls.gov)

U.S. Department of Labor. Bureau of Labor Statistics. *Employment and Earnings*. Table 11 of the Annual Averages Tables, January issues (1984-1997), and BLS underlying statistical details. (Washington, DC: various years).

*Data source:* Employment by occupation data are from *Employment and Earnings*, a monthly publication of the Bureau of Labor Statistics (BLS). The data source of *Employment and Earnings* is the *Current Population Survey*, a monthly household survey conducted by the Census Bureau for the BLS. The *Current Population Survey* provides a comprehensive body of information on the employment and unemployment experience of the U.S. population, classified by age, sex, race, and a variety of other characteristics.

Annual employment averages are arithmetic averages of the 12 monthly estimates for a particular year. The BLS does not publish data reliability information along with estimates. Instead, it provides estimation formu-

las and the necessary parameters so that users can estimate standard errors for estimates of their interest. For additional information, see the “Explanatory Notes and Estimates of Error” in *Employment and Earnings*.

*Employed labor force:* National labor force figures in this table represent the total employed civilian labor force. This figure differs from the data for U.S. labor force in Table 1-1 because it includes only those that are currently employed among the civilian U.S. labor force. In contrast, the data in Table 1-1 represent those individuals in the civilian labor force that are both employed and unemployed.

### Table 2-6 Receipts and Payments Related to International Merchandise and Services Trade

(Current U.S. dollars)

#### All countries

Tables 2-6 through 2-8b contain data on international merchandise and service trade for the three countries. At the aggregate level, the data categories in these tables can be considered conceptually comparable across the countries. However, each country has also chosen to use its own data for international merchandise and services trade. For example, Table 2-7b reports Canadian trade with the United States, according to Canadian data sources. Table 2-8a reports U.S. trade with Canada, according to U.S. data sources. Differences between these data sources are caused by differences in definitions, methodologies and statistical sources, among the three countries. Also note that detailed data for Mexico were not available. Therefore, no Mexican tables have been included showing trade with Canada and the U.S., according to Mexican data

sources. Merchandise trade data by country, value, weight, mode of transportation, port and commodity description are included in Sections 6 and 7.

### Canada

Statistics Canada. *Canada's Balance of International Payments, Catalogue 67-001-XPB*. (Ottawa, Ont.: various years).

Statistics Canada. Special tabulations. (Ottawa, Ont.: 1998).

*Definitions of merchandise and services trade:* For this table, the definitions of goods and services are those utilized and defined by the Canadian Balance of Payments (BOP). Under this framework, goods are defined as exports and imports that are valued at the border of the exporting economy. That is, the valuation of goods includes transportation costs to the border. Inland freight charges are recorded as an adjustment to Canadian Customs trade data. Goods also include all goods that cross the border to be processed. Together with the inland freight adjustment to Canadian Customs trade data, additional adjustments are made for timing, coverage and other valuation and residency.

All services definitions were restated in May 1996 according to international norms first issued by the International Monetary Fund (IMF) in 1993 and extended jointly by the IMF, the OECD and the statistical arm of the European Union, Eurostat. The redefined services include the following categories: travel, transportation, commercial and government services. However, for the purposes of Table 2-6, 2-7a and 2-7b, Canadian data have been represented in the two major categories of transportation and tourism and other services. The Canadian data category "travel" is included in the tourism category for these

tables, and the Canadian categories of "commercial and government services" are included in the other services category for these tables.

*Merchandise exports:* Merchandise exports data in this table are based on Canadian Customs export data that are published by the International Trade Division of Statistics Canada. Canadian Customs exports to overseas countries are valued f.o.b. (free on board) port of exit. Canadian Customs exports to the United States are valued f.o.b., point of exit (at the border). Customs data therefore, include inland freight charges, but these are removed from the Balance of Payment data, as a negative adjustment to the trade. A new Balance of Payments estimate for inland freight is then added to the exports, which are valued at plant basis. (Valued at plant basis means the value of goods f.o.b. (free on board) at the place of lading; i.e., at the point of production for the majority of commodities.) Other Balance of Payments adjustments include adjustments for valuation, residency, timing and coverage.

*Merchandise imports:* Merchandise imports data in this table are based on Canadian Customs import data that are published by the International Trade Division (ITD) of Statistics Canada. For Table 2-6, Canadian customs imports are valued f.o.b., based on the place of direct shipment to Canada. Although it does not make any difference at the aggregate level, import data released by Statistics Canada's Balance of Payments and International Trade Divisions are different on a geographical basis. The International Trade Division records the imports according to a country of origin basis while the Balance of Payments Division reports imports on a country of last consignment basis.

*Transportation services:* Transportation services cover receipts and payments related to the transportation of persons and goods by air, water and land, together with supporting services for the various modes of transport. Receipts cover passenger fares received by Canadian carriers (primarily air) from nonresidents; services of carriers operated by Canadian residents (ocean ships, lake vessels, aircraft, rail and trucks) that transport merchandise exports beyond the borders of Canada; carriers operated by Canadian residents engaged in the transportation of commodities between foreign countries (including intransit movement and transit between U.S. points via Canada); income from the charter of vessels; and port expenditures in Canada by nonresidents air and shipping companies. Payments cover passenger fares paid to nonresident carriers (chiefly air) by Canadian residents. The data also include most outlays on cruises although such outlays should in principle be assigned to travel. Payments also cover the transport by nonresident carriers of imports into Canada (excluding inland freight charges in the United States and other countries); the transport of Canadian commodities in transit through the United States (in particular oil and natural gas); the charter of foreign vessels; and port expenditures abroad by Canadian resident air and shipping companies.

*Tourism and other services:* Data for tourism cover all receipts and payments arising from the travel of less than 1 year between Canada and other countries, and for travel of more than 1 year for educational or health purposes. Travelers of more than 1 year are otherwise treated as residents of the country to which they travel except for diplomats and military personnel on postings abroad. Data for other services include government ser-

vices for international transactions arising from government activities (diplomatic, commercial and military) not covered elsewhere in the Balance of Payments. Receipts for this category chiefly comprise expenditures in Canada by foreign governments. Payments for this category mainly cover expenditures abroad of both the Canadian federal and provincial governments. Other services also include receipts and payments for commercial services.

### **Mexico**

Banco de México. *Indicadores Económicos*. (Mexico City, D.F.: 1998).

Data are based on the Banco de Mexico's Balance of Payments, Current Account framework. Transactions of the maquiladora industry are included in services and merchandise trade for 1995 and 1996, but *not* for 1990. For the category Merchandise Exports, export valuation is made on an FOB basis; i.e., the value of the goods at their point of origin, plus freight, insurance and other costs to move the goods to the outbound customs house. For the category Merchandise Imports, imports are valued on an FOB basis; i.e., market value of the goods at the point of origin, plus freight, insurance and other expenses to move the goods to the inbound customs house. For the category Tourism and Other Services, tourism includes expenditures by tourists, including people on day-excursions (i.e., those tourists who do not stay overnight). The category Transportation includes costs of freight and insurance.

### **United States**

U.S. Department of Commerce. Bureau of Economic Analysis. *Survey of Current Business*. (Washington, DC: September 1993, July 1996, and October 1997).

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U.S. Department of Commerce. Bureau of Economic Analysis. *1998 Annual Services Historical Disk*. (Washington, DC: 1998).

*Merchandise exports and imports:* Exports exclude goods exported under U.S. military agency sales contracts identified in the U.S. census export data. Imports exclude goods under direct defense expenditures identified in the U.S. census import data. Merchandise imports are valued according to the "Customs value," which represents the value of merchandise for duty (or Customs) purposes. (Thus, the Customs value is usually the selling price in the foreign country of origin, and *excludes* freight costs, insurance and other charges incurred in bringing the merchandise from the foreign port of export to the United States.) For exports to all countries except Canada, export values represent the reported value of the merchandise, usually the selling price, plus insurance, inland freight costs and other charges incurred in bringing the merchandise to the U. S. port of export. This is generally called the f.a.s. (free alongside ship) value. Because the United States does not collect information for U.S. exports to Canada from its own trade documents, the value of these exports represents the transaction value of the merchandise, plus a Statistics Canada *imputed* estimate of the costs of insurance, inland freight and other charges.

*Trade adjustments, total:* The Bureau of Economic Analysis (BEA) at the Department of Commerce makes several adjustments to U.S. merchandise trade data when these are incorporated in the U.S. Balance of Payments. These include adjustments for inland freight charges and other adjustments made for valuation, residency, timing and coverage purposes. Inland freight adjustments are made to U.S. data for merchandise imports

from Canada because the Customs value of imports for certain Canadian goods is the point of origin in Canada rather than the port of export in Canada. Since the reported value of U.S. exports includes inland freight costs, no adjustments are needed, except for U.S. exports to Canada. Because the United States does not collect information for U.S. exports to Canada from its own trade documents, the value of these exports represents the transaction value of the merchandise, plus a Statistics Canada *imputed* estimate of the costs of insurance, inland freight and other charges. The Statistics Canada estimate is based on 4.5 percent of the export merchandise transaction value.

*Total services:* Total services data include total transactions in services, including private services, U.S. government miscellaneous services and some goods. Export services also include transfers under U.S. military agency sales contracts. Import services also include direct defense expenditures. Private services included in the total services category consist of the following categories in the U.S. Balance of Payments: (1) travel, (2) passenger fares, (3) other transportation, (4) royalties and license fees and (5) other private services.

*Transportation services:* Transportation services data include passenger fares paid by residents of one country to airline and vessel operators who reside in another country. Exports consist of fares received by U.S. operators for transporting foreign residents between the United States and a foreign country and between foreign countries. Imports consist of fares paid to foreign operators by U.S. residents for travel to and from the United States. The rest of transportation services include transactions for freight and port

services for the transportation of goods by water, air and land to and from the United States. Freight receipts of U.S. carriers are for transporting U.S. goods between two foreign points; freight payments to foreign carriers are for transporting U.S. merchandise imports. Port services receipts are the value of the goods and services procured by foreign carriers in both U.S. ocean and air ports; port services payments are the value of goods and services procured by U.S. carriers in foreign ocean and air ports. The land transportation receipts and payments cover U.S. transactions with Canada and Mexico through trucks, rail and pipelines. However, trucking operations between the United States and Mexico are currently limited by regulation.

*Tourism and other services:* Tourism and other services data are based on a compilation of the following categories in the U.S. balance of payments account: travel, passenger fares, other transportation, royalties and license fees, other private services and government services. Tourism is not a separate category in these accounts. Therefore, the number for this entry is the difference between total services and transportation.

**Tables 2-7a and 2-7b**  
**Canada's Receipts From and Payments to Mexico for Merchandise and Services Trade**

**Canada's Receipts From and Payments to the United States for Merchandise and Services Trade**

(Current U.S. dollars)

**Canada**

Statistics Canada. *Canada's Balance of International Payments, Catalogue 67-001-XPB*. (Ottawa, Ont.: various years).

Statistics Canada. Special tabulations. (Ottawa, Ont.: 1998).

Tables 2-7a and 2-7b contain import data based on customs origin and based on consignment. The category, *Imports, Customs Origin*, are those imports that are attributed to their country of origin; that is, the country in which the goods were grown, extracted or manufactured in accordance to the rules of origin administrated by Revenue Canada, Customs and Excise. The category, *Imports, Consignment* are those imports that are attributed to their last country of consignment. This valuation is done for Balance of Payment purposes and better reflects the notion of change of ownership.

**Tables 2-8a and 2-8b**  
**U.S. Receipts From and Payments to Canada for Merchandise and Services Trade**

**U.S. Receipts From and Payments to Mexico for Merchandise and Services Trade**

(Current U.S. dollars)

**United States**

U.S. Department of Commerce. Bureau of Economic Analysis. *Survey of Current Business*. September 1993, July 1996 and October 1997. (Washington, DC: various years).

U.S. Department of Commerce. Bureau of Economic Analysis. *1998 Annual Services Historical Disk*. (Washington, DC: 1998).

See note for Table 2-6 for an additional explanation of similar data elements. However, note that total services in Tables 2-8a and 2-8b include only private services. Data were not available for government services because the government services data are not reported at the level of individual countries.

## SECTION 3: TRANSPORTATION SAFETY

### Tables 3-1 and 3-2

#### Transportation Fatalities by Mode Transportation Injuries by Mode

##### All Countries

**Air:** United States and Canada include fatalities and injuries from both passenger and all-cargo flights. Mexico includes fatalities from passenger flights only. For the U.S. and Canada, the air carrier data represent their own national flag carriers, operating both domestic and international flights.

**Road:** The United States and all Canadian provinces and territories, with the exception of the province of Québec, count all fatalities that occur within 30 days of the accident (and can be attributed to the accident). Canada's Province of Québec counts all fatalities that occur within 8 days of the accident (and can be attributed to the accident). Mexico counts only fatalities at the site of the accident. In the U.S., the 30-day rule was initiated for fatalities from road crashes in September 1978, and a consensus to apply this rule across all modes was formulated in 1995.

**Water transport:** U.S. and Canadian data are not comparable in several respects. First, the United States counts fatalities and injuries from vessel casualties for U.S. flag vessels *anywhere in the world*, and for foreign flag vessels within the jurisdiction of the United States. The Canadian data include only Canadian and foreign flag vessels operating in Canadian waters. Second, the Canadian data exclude all fishing vessels, except factory ships; the United States data include fishing vessels. (See the entries under Canada and the United States, below, for more complete definitions.)

## Canada

Tables 3-1 and 3-2 are based on the following primary sources:

**Air:** Transportation Safety Board of Canada. (TSB) Special tabulation. (Ottawa, Ont.: 1998).

**Road:** Transport Canada. Road Safety and Motor Vehicle Regulation. *Traffic Accident Information Database*. Special tabulation. (Ottawa, Ont.: 1998).

**Pipeline:** Transportation Safety Board of Canada. (TSB) Special tabulation. (Ottawa, Ont.: 1998).

**Rail:** Transportation Safety Board of Canada (TSB). Minister of Public Works and Government Services. *TSB Statistical Summary: Railway Occurrences–1997*. (Ottawa, Ont.: 1998).

**Water, Commercial Passenger and Freight Vessels:** Transportation Safety Board of Canada (TSB). Minister of Public Works and Government Services. *TSB Statistical Summary: Marine Occurrences–1997*. (Ottawa, Ont.: 1998).

**Water, Recreational Boats:** Canadian Red Cross. Special tabulation. (Ottawa, Ont.: 1998).

The following definitions apply for air, rail and water data in Tables 3-1 through 3-4. Technical notes for Canadian data in Tables 3-1 and 3-2 adhere to these definitions.

**Aviation accident:** A reportable aviation accident is an accident resulting directly from the operation of an aircraft where a person sustains a serious injury or is killed as a result of: being on board the aircraft; coming into contact with any part of the aircraft or its contents; being directly exposed to the jet blast or rotor down-wash of the aircraft; the aircraft sustaining damage that adversely



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affects the structural strength, performance or flight characteristics of the aircraft and that requires major repair or replacement of any affected component part; or the aircraft is missing or inaccessible.

*Serious air injury:* A serious air injury is an injury that is sustained by a person in an accident and that: requires hospitalization for more than 48 hours, commencing within 7 days of the date that injury was received; results in a fracture of any bone (except simple fractures of fingers, toes or nose); involved lacerations that cause severe hemorrhage, nerve muscle, or tendon damage; involves injury to any internal organ; or involves second or third degree burns, or any burns affecting more than 5 percent of the body surface; involves verified exposure to infectious substances or injurious radiation.

*Railway accident:* A reportable railway accident is one resulting directly from the operation of rolling stock, where: (1) a person sustains a serious injury or is killed as a result of being on board or getting off the rolling stock or coming into contact with any part of the rolling stock or its contents; or (2) the rolling stock is involved in a grade-crossing collision, is involved in a collision or derailment and is carrying passengers; is involved in a collision or derailment and is carrying dangerous goods, or is known to have last contained dangerous goods the residue of which has not been purged from the rolling stock; sustains damage that affects its safe operation; or causes or sustains a fire or explosion, or causes damage to the railway, that poses a threat to the safety of any person, property or the environment.

*Serious rail injury:* A serious rail injury is one that is likely to require admission to a hospital.

*Marine accident:* A reportable marine accident means an accident resulting directly from the operation of a ship other than a pleasure craft, where a person sustains a serious injury or is killed as a result of: being on board the ship or falling overboard from the ship, or coming into contact with any part of the ship or its contents, or the ship sinks, founders or capsizes, is involved in a collision (which includes collisions, strikings or contacts), sustains a fire or an explosion, goes aground, sustains damage that affects its seaworthiness or renders it unfit for its purpose, or is missing or abandoned. In this definition, “ship” includes: a) every description of vessel, boat or craft designed, used or capable of being used solely or partly for marine navigation without regard to method or lack of propulsion. For statistical purposes, these accidents are classified as “accidents aboard ship.” In addition, the definition of “ship” also includes dynamically supported craft. For statistical purposes, these are classified as “shipping accidents.” “Pleasure craft” means a vessel that is used for pleasure or recreation and does not carry goods or passengers for hire or reward.

*Air:* Data in Tables 3-1 and 3-2 comprise fatalities and injuries on Canadian aircraft involved in accidents in domestic and international airspace. Passenger and all-cargo flights are included. Scheduled and nonscheduled flights are included. Fatalities and injuries that occur on the ground are excluded from the statistics.

*Air carrier:* Air carrier data in Tables 3-1 and 3-2 are compiled according to regulatory definitions of registered aircraft types established by the Transportation Safety Board of Canada and include the following types of Canadian registered aircraft used by Canadian air operators that offer a “for-hire” service to transport people or goods, or to undertake specific tasks such as aerial photography, flight training and crop spraying:

- (1) An **airliner** is an airplane used by a Canadian air operator in an air transport service or in aerial work involving sightseeing operations, that has a maximum take-off weight (MCTOW) of more than 8,618 kg (19,000 pounds) or for which a Canadian-type certificate has been issued authorizing the transport of 20 or more passengers.
- (2) A **commuter aircraft** is an airplane used by a Canadian air operator, in an air transport service or in aerial work involving sightseeing operations, of any of the following aircraft: a) a multi-engined aircraft that has a maximum take-off weight (MCTOW) of more than 8,618 kg (19,000 pounds) and a seating configuration, excluding pilot seats, of 10 to 19 inclusive; or b) a turbo-jet-powered aeroplane that has a maximum zero fuel weight of 22,680 kg (50,000 pounds) or less and for which a Canadian type certificate has been issued authorizing the transport of not more than 19 passengers.

- (3) An **air taxi or specialty aircraft** is an airplane used by a Canadian operator on an on-hire basis that does not satisfy the definition of an airliner or a commuter aircraft. Air carrier data also may include fatalities and injuries from charter aircraft operations.

Air data in Table 3-1 and Table 3-2 include fatalities and injuries that occurred on all passenger and cargo flights of Canadian registered aircraft during 1990, 1995 and 1996, operating domestically and internationally. The numbers of fatalities and injuries that occurred on cargo flights of Canadian registered aircraft during 1990, 1995 and 1996 are as follow:

Year	Fatalities	Injuries
1990	0	1
1995	0	0
1996	4	0

**Note:** In 1991, there was one fatality/injury-type air accident in the Province of Québec involving a Canadian registered cargo aircraft (Reference: Transportation Safety Board of Canada Occurrence Number 91Q0150). This air accident had one air fatality and one air injury.

*General aviation:* General aviation data in Tables 3-1 and 3-2 are compiled according to regulatory definitions established by the Transportation Safety Board of Canada and includes fatalities and injuries on ultra-light aircraft, private and commercial helicopter operations and from flights that do not transport people or cargo on a “for-hire” basis.

Below are the specific details of those air accidents involving cargo flight of Canadian registered aircraft during 1990, 1995 and 1996:

Occurrence number	Occurrence date	Province of occurrence	Number of fatalities	Number of injuries
90Q0119	05/19/90	Québec	0	1
A95Q0144	07/28/95	Québec	0	0
A96A0134	07/22/96	Newfoundland	3	0
A96P0175	08/14/96	British Columbia	1	0

**Note:** In 1995, there was one air accident, which occurred in the Province of Québec (Reference: Transportation Safety Board of Canada Occurrence Number A95Q0144) involving a Canadian registered cargo aircraft for which there was extensive damage reported to the aircraft, but no fatalities or injuries.

*Road:* Road data for passenger cars and light trucks include statistics for automobiles and light trucks (pick-ups, sports utility vehicles and mini-vans). Motorcycle data include both mopeds and motorcycles. Data for heavy trucks include straight trucks greater than 4,536 kilograms, (a straight truck has a configuration where both the vehicle's power unit and cargo storage unit share the same chassis), tractor-trailers and other unspecified trucks. Road data for other types of road injuries and fatalities include all other vehicle types and nonvehicle occupants involved in a motor vehicle traffic collision. Road data for Canadian motor vehicle fatalities and injuries are derived from the Canadian Traffic Accident Information Database (TRAID). TRAID is a collection of data pertaining to traffic collisions provided annually to Transport Canada by Canada's ten provinces and three territories. These collisions are all those deemed reportable; i.e., they occur on public roads and incur bodily harm and/or property damage exceeding a stipulated dollar threshold. This threshold is determined independently by each provincial and territorial jurisdiction.

The accident segment contains general data about the accident scene such as road conditions and summary accident statistics such as the total number of persons killed. Each accident within each province and each calendar year has a unique case number. The vehicle segment contains vehicle specific data such as the vehicle type and the vehicle actions prior to and during the collision. Each vehicle involved in the collision will have a separate vehicle segment. Therefore, if there are two vehicles involved there will be two different vehicle segments associated with that collision. Each of these vehicles will have a unique vehicle identification number.

*Pipeline:* Pipeline data in Table 3-2 include both minor and serious injuries for 1990. Only serious injuries are included for 1995 and 1996.

*Rail:* Rail data for Table 3-2 include both minor and serious injuries for 1990. Only serious injuries are included for 1995 and 1996.

*Water transport, commercial:* Water data for both commercial passenger vessels and commercial freight vessels include both Canadian and foreign flag vessels operating in Canadian waters. Data for commercial passenger vessels include, e.g., cruise ships and ferries. Data for commercial freight vessels include cargo/container, bulk carrier/OBO (Ore-Bulk-Oil) carrier, tanker, tug, barge/pontoon and ferry vessels. Data for commercial freight vessels exclude all fishing vessels, except factory ships, as well as research vessels, oil exploration and support ships.

*Water transport, recreational boats:* Water data for recreational boating include drownings from recreational, daily living, occupational, rescue and unknown purposes, as well as other fatal boating injuries including immersion, hypothermia, collisions and propeller injuries. The source for this information is the Canadian Red Cross. Fatalities for 1990, and injuries for 1990 through 1996, are nonexistent.

### **Mexico**

*Air:* Secretaría de Comunicaciones y Transportes. Dirección General de Aeronáutica Civil. (Mexico City, D.F.: 1998). Special tabulation.

*Road and rail:* Instituto Nacional de Estadística, Geografía e Informática. Dirección de Estadísticas Económicas, based on data collected by the Procuraduría General de Justicia del Distrito Federal and the Direcciones de Seguridad Pública y Vialidad and their equivalent agencies at state and local levels. (Mexico City, D.F.: various years).

*Road (in areas under federal jurisdiction):* Secretaría de Comunicaciones y Transportes. Dirección General de Policía Federal de Caminos y Puertos. (Mexico City, D.F.: 1998).

*Air:* Data represent fatalities and injuries arising from general aviation accidents or incidents recorded within Mexico, and include passenger and crew fatalities and injuries at the site of the accident. All-cargo flights are not included, although the number of fatalities and injuries from all-cargo flights is estimated to be small.

*Road:* In Table 3-1, data refer to fatalities in fatal accidents; i.e., where one or more people died at the site of the accident. In Table 3-2, data refer to people injured in an accident; i.e., where one or more people were injured, with or without fatalities. The numbers assigned by type of vehicle refer only to accidents in urban and suburban areas. For accidents in zones of federal jurisdiction, no breakdown by type of vehicle is available, but the fatalities and injuries are included in the overall totals for road. Therefore, the road subcategories will not sum to the overall road totals for fatalities and injuries. The subcategory of "other" includes accidents in trolley buses, trams, bicycles and others.

*Rail:* Data include only fatalities and injuries from accidents in urban and suburban zones.

### **United States**

Tables 3-1 and 3-2 are based on modifications of similar tables (including adjustments to definitions) published in the U. S. Department of Transportation, Bureau of Transportation Statistics. *National Transportation Statistics 1998.(NTS-98)* (Washington, DC: 1998) and *National Transportation Statistics 1999 (NTS-99)* (Washington, DC: 1999).

Tables 3-1 and 3-2 are based on the following primary sources:

*Air:* National Transportation Safety Board. *Aviation Accident Statistics*. Web site: [www.nts.gov/aviation/Stats.htm](http://www.nts.gov/aviation/Stats.htm)

National Transportation Safety Board. *Accident Synopses*. Web site: [www.nts.gov/aviation/Accident.htm](http://www.nts.gov/aviation/Accident.htm)

National Transportation Safety Board. *Annual Review of Aircraft Accident Data*, annual issues and *NTSB Press Release, SB97-03*. (Washington, DC: various years). (fatalities)

National Transportation Safety Board. Analysis and Data Division, RE-50. (Washington, DC: various years). (injuries)

See also: U.S. Department of Transportation. Federal Aviation Administration. *Statistical Handbook of Aviation 1996*. (Washington, DC: 1997). Chapter 9. Web site: [api.hq.faa.gov/handbook/1996/toc96.htm](http://api.hq.faa.gov/handbook/1996/toc96.htm)

Road: U.S. Department of Transportation. National Highway Traffic Safety Administration. National Center for Statistics and Analysis. *Fatality Analysis Reporting System (FARS)*, and, for injuries, *the General Estimates System (GES)*, 1998. (Washington, DC: 1998).

U.S. Department of Transportation. National Highway Traffic Safety Administration. *Traffic Safety Facts*, 1997. (Washington, DC: November, 1998).

Pipeline (liquid and gas): U.S. Department of Transportation. Research and Special Projects Administration. Office of Pipeline Safety, DPS-35. (Washington, DC: 1998).

Rail: Highway grade crossing: U.S. Department of Transportation. Federal Railroad Administration. *Rail-Highway Crossing Accident/Incident and Inventory Bulletin*. (Washington, DC: various years). Table S.

Railroad: U.S. Department of Transportation. Federal Railroad Administration. *Accident/Incident Bulletin*. (Washington, DC: various years). Table 7.

Transit: Transit rail: U.S. Department of Transportation. Federal Transit Administration. *Safety Management Information Statistics (SAMIS)*. (Washington, DC: various years).

Water: Commercial freight and passenger Vessels: U.S. Department of Transportation. U.S. Coast Guard. Office of Investigations and Analysis. Compliance Analysis Division, G-MOA-2. (Washington, DC: 1998).

Recreational boating: U.S. Department of Transportation. U.S. Coast Guard. Office of Investigations and Analysis. Compliance Analysis Division. *Boating Statistics*. (Washington, DC: various years).

*Cross-modal comments*: For 1995 and 1996, a death is attributed to a transportation incident if the death occurred up to 30 days after the incident. For 1990, this may not be true for all modes, but this definition has applied in the Road mode since September of 1978.

Caution must be exercised in comparing U.S. fatalities (and injuries) across modes, because significantly different definitions for reportable **events** are used among the modes. In particular, rail and transit fatalities and injuries include deaths and injuries that are not, strictly speaking, caused by transportation accidents, but are caused by such events as a fall on a transit station escalator, or, for railroad employees, a fire in a workshed. Similar fatalities for the air and highway modes (deaths at airports not involving aircraft, or fatalities from accidents in automobile repair shops) are not counted towards the totals for these modes. Counting fatalities not necessarily directly related to transportation potentially overstates the risk for the rail and transit modes. For the waterborne mode, fatalities from vessel casualties are counted in the total, and other

fatalities are not counted. (Vessel casualties are incidents involving damage to vessels, for example, from collisions, groundings, fires or explosions.) Fatalities not from vessel casualties include, for example, deaths from accidents involving on-board equipment. Thus, fatalities for the waterborne mode are potentially understated. (Everything stated above about fatalities also applies to injuries.) In addition to the modal differences for definitions of reportable events, definitions of reportable injuries also vary among the modes. See the *National Transportation Statistics (NTS)-99* or the *NTS-98* for a description of what constitutes a reportable injury for each mode.

In addition, it should be emphasized that the numbers for total fatalities and injuries are less than the sum of the modal totals for the United States because some deaths (injuries) are reported and counted in more than one mode. To avoid double counting, the following components **have been counted only once** in arriving at the overall totals shown in Tables 3-1 and 3-2:

- (1) Rail-highway grade crossing fatalities (injuries) involving motor vehicles: These are counted in both the rail and road modes, and are included in both modal totals.
- (2) Commuter rail fatalities (injuries) arising from *incidents*: These are counted in both the rail and the transit modes, and are included in both modal totals.
- (3) Motor bus fatalities (injuries) arising from *accidents*: These are counted in both the road and the transit modes, and are included in both modal totals.

- (4) Demand response and vanpool fatalities (injuries) arising from *accidents*: These are counted in both the road and the transit modes, and included in both modal totals.

For additional information, refer to Table 3-4 in the *National Transportation Statistics—1998* or the *National Transportation Statistics—1999* to see exactly how these adjustments have been made to the 1995 and 1996 fatality totals. Note that *incidents include accidents; that is, accidents are a subset of incidents*. See below under the individual modal comments on transit and rail for more complete definitions of incidents and accidents. Data on highway-rail grade crossing fatalities and injuries that involved motor vehicles are provided in the annual issues of the Federal Railroad's Administration's *Highway-Rail Crossing Accident/Incident and Inventory Bulletin*. (See above for the full citation.) Data on transit accidents and incidents by submode are provided in the *National Transportation Statistics, 1999*, Tables 3-28 and 3-29.

*Air*: Air carriers include all U.S. flag carriers, comprising both scheduled and nonscheduled flights, both domestic and international flights, and both passenger and all-cargo flights. Commuters and on-demand air taxis are included. In Table 3-2, only "serious injuries" are reported. (See the *National Transportation Statistics (NTS)-1999* or the *NTS-98* for the definition of a serious injury in air accidents.) U.S. air fatality and injury data are based on reports from the National Transportation Safety Board (NTSB). NTSB investigators perform on-site and off-site investigation of all accidents involving U.S. registered air carriers and general aviation aircraft. Federal regulations require operators to notify the NTSB immediately of avia-

tion accidents and certain incidents. According to the NTSB, a reportable accident “is defined as an occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage.” Web site: [www.nts.gov/aviation/report.htm](http://www.nts.gov/aviation/report.htm).

As stated above, the air safety data include both passenger and all-cargo flights. The National Transportation Safety Board’s web site at [www.nts.gov/aviation/Accident.htm](http://www.nts.gov/aviation/Accident.htm) does not separate passenger flights from all-cargo flights. However, for flights operating under 14 CFR-121 (aircraft with more than 30 seats or a payload of more than 7,500 pounds), the detailed accident reports available on the web site make it clear which were all cargo flights. For smaller aircraft, particularly on-demand air taxis, it is not possible to infer with confidence how many were all cargo flights from the information available on the web site. **For aircraft operating under CFR-121:**

1990: 6 fatal accidents, of which 2 were all-cargo flights; 39 fatalities, of which 28 occurred as the result of an all-cargo aircraft crash. (Ground fatalities included.)

1995: 3 fatal accidents, of which 2 were all-cargo flights; 168 fatalities, of which 8 occurred as the result of an all-cargo aircraft crash. (Ground fatalities included.)

1996: 5 fatal accidents, of which 2 were all-cargo flights; 380 fatalities, of which 38 occurred as the result of an all-cargo aircraft crash. (Ground fatalities included.)

It should also be noted that during the research phase of this project, a change in regulations occurred. Since March 20, 1997, 14 CFR-121 began to cover some smaller aircraft (i.e., aircraft with 10 or more seats) that were formerly regulated under 14 CFR-135. This change does not affect the data in this publication, because of its 1996 cutoff.

*Road:* The data for passenger cars, light trucks, buses and large trucks are the number of *occupants* of these vehicles who have been killed (injured) in road crashes. In Tables 3-1 and 3-2, *Light Truck* means trucks of 4,536 kg (i.e., 10,000 pounds) gross vehicle weight rating or less, and *Large Truck* means trucks of over 4,536 kg gross vehicle weight rating. Note that these definitions differ from those in some other tables in this publication. Buses include intercity buses, school buses and local transit buses. The subcategory of “other” represents pedalcyclists, other nonoccupants and unknown. See the *National Transportation Statistics (NTS)*-1999 or the *NTS-98* for the definitions of a reportable road injury.

U.S. road fatality data come from the Fatality Analysis Reporting System (FARS), and are compiled by FARS analysts at the regional offices of the U.S. Department of Transportation’s National Highway Traffic Safety Administration (NHTSA). FARS analysts use a census of police accident reports, state vehicle registration files, state drivers licensing files, state highway department data, vital statistics, death certificates, coroner/medical examiner reports, hospital medical reports and emergency medical service reports. A separate form is completed for each fatal crash. Fatality data are continuously collected and electronically submitted to the NHTSA database. Cross verification of police reports with death certificates ensures that

undercounting is rare. The FARS data do not include motor vehicle fatalities on nonpublic roads. However, previous NHTSA analysis has found that these fatalities account for 2 percent or fewer of the total motor vehicle fatalities per year.

U.S. road injury data come from the General Estimates System (GES) of the National Traffic Safety Administration at the U.S. Department of Transportation. The GES data are a nationally representative sample of police reported crashes involving at least one motor vehicle and resulting in injuries, fatalities and property damage in which a police accident report (PAR) was filled out. GES data collectors randomly sample PARs and forward copies to a central contractor for coding into a standard format for the GES system. Documents such as police diagrams or supporting text provided by the officer may be further reviewed to complete the data entry. Various sources suggest that about half of the motor vehicle crashes in the United States are not reported to police and that the majority of these unreported crashes involve minor property damage and no significant personal injury. A NHTSA study of injuries from motor vehicle crashes estimated the total count of nonfatal injuries at over 5 million compared with the GES's estimate of 3.2 million for the same year.

*Pipelines:* U.S. fatality and injury data for pipeline in Tables 3-1 and 3-2 are based on liquid (crude oil and petroleum products) and natural gas pipelines. Each of these is regulated under separate safety regulations by the Office of Pipeline Safety of the Research and Special Projects Administration at the U.S. Department of Transportation. For both liquid and natural gas pipelines, accidents are required to be reported as soon as possible, but no later than 30 days after discovery. Re-

ports are sent to the Federal Office of Pipeline Safety's Information Systems Manager. Possible sources of error include a release going undetected, even if such a release is subsequently detected and reported, it may not be possible to reconstruct the accident accurately.

*Liquid pipelines:* U.S. fatality and injury data for liquid pipelines are derived from reports filed with the Office of Pipeline Safety at the Research and Special Projects Administration, USDOT. These reports are based on regulations that define a reportable accident for liquid pipelines as: "...each failure in a pipeline system... in which there is a release of the hazardous liquid or carbon dioxide transported resulting in any of the following: (a) explosion or fire not intentionally set by the operator; (b) loss of 50 or more barrels of hazardous liquid or carbon dioxide; (c) release to the atmosphere of more than five barrels a day of highly volatile liquids; (d) death of any person; and (e) bodily harm to any person; and (f) estimated property damage to the property of the operators or others, or both, exceeding \$50,000. (For more information, refer to *NTS-98* or *NTS-99*).

*Natural gas pipelines:* U.S. fatality and injury data for natural gas pipelines are based on reports filed with the Office of Pipeline Safety at the U.S. Department of Transportation. These reports conform with regulations from the same office that define a reportable accident for gas pipelines as any of the following events:

- (1) An event that involves the release of gas from a pipeline or liquefied natural gas or gas from an LNG facility and
  - (i) a death, or personal injury necessitating in-patient hospitalization; or



- (ii) estimated property damage, including cost of gas lost, of the operator or others, or both, of \$50,000 or more.
- (2) An event that results in an emergency shutdown of an LNG facility.
- (3) An event that is significant, in the judgment of the operator, even though it did not meet the criteria of paragraphs (1) or (2)."

*Railroad:* Railroad data include intercity passenger, freight rail and commuter rail fatalities and injuries. Note that commuter rail fatalities and injuries also are reported under transit, as explained above in Cross-Modal comments. U.S. railroad fatality and injury data are based on reports that railroads are required to file for each train accident resulting in property damage in excess of \$6,300, each highway-rail accident, and each incident involving the operation of a railroad resulting in a fatality or a reportable injury. These reports cover workers, trespassers and others not on trains in addition to passengers and train crew. For more detail, see the U.S. Department of Transportation, Federal Railroad Administration, *Highway-Rail Crossing Accident/Incident and Inventory Bulletin, Calendar Year 1994* (July 1995), which also defines a reportable injury for rail, or refer to the *National Transportation Statistics (NTS)-1999* or the *NTS-98*.

The Federal Railroad Administration defines three categories of reportable events:

- (1) Train Accident: a collision, derailment, or other event involving the operation of railroad on-track equipment resulting in damages that exceed the reporting threshold.

- (2) Train Incident: any event involving the movement of railroad on-track equipment that results in a death, a reportable injury, or a reportable illness, but in which railroad property damage does not exceed the reporting threshold.
- (3) Nontrain Incident: an event arising from railroad operations but not from the movement of on-track equipment, which does not exceed the reporting threshold, and results in a death, a reportable injury, or a reportable occupational illness.

The reporting requirements (established in law) encompass events not strictly related to transportation. For example, if a passenger falls and breaks a leg in the station while going to a train, the injury would be reported and appear in the data as a rail injury.

*Transit:* In Tables 3-1 and 3-2 the transit total includes: transit motor bus; trolley bus; light rail (streetcar-type vehicles); heavy rail (subway); commuter rail; van-pool; demand-response (mainly transportation for the disabled or elderly); and automated guideway (electric railway operated without a vehicle operator or other crew). Figures for transit rail include light rail, heavy rail and commuter rail. Commuter rail also is included in the data for railroad fatalities and injuries. The transit total does not include data for several minor submodes, notably cable cars and ferryboats; see the *National Transportation Statistics-99 (NTS-99)*, footnotes to Tables 3-27, 3-28 and 3-29 for data on these submodes. See the *NTS-99* or the *NTS-98* for the definition of a reportable transit injury.

U.S. transit fatalities and injuries are obtained from the Federal Transit Administration's (FTA) National Transit Database (NTD) Reporting System. A transit agency is required to file a NTD report at regular intervals if it is a recipient of Urbanized Area Formula Funds. Some 400 transit agencies report, and because some agencies own and operate more than one form of transit, approximately 600 transit services are covered. Such transit operators are responsible for 90 to 95 percent of passenger kilometers traveled on transit. Other transit operators are encouraged to submit NTD forms. The transit operators report on fatalities, injuries, accidents, incidents, and property damage in excess of \$1,000. Electronic reporting has recently been implemented for the NTD. A certification from the Chief Executive Officers (CEO) must accompany all NTD reports along with an independent Auditor's Statement. When an NTD report is received, a validation process is set up, which includes a preliminary review of the data for completeness. The report is further reviewed and outstanding items are noted in writing to the agency that submitted the form.

Transit safety data are collected in four major categories: (1) collisions, (2) derailments/buses going off road, (3) personal casualties and (4) fires. The major categories are further broken down into subcategories. *Collisions* comprise collisions with vehicles, objects and people (except suicides). Of the four major categories, only the first two are included in the definition of *accident* adopted in the *National Transportation Statistics*. This definition of *accident* is relevant to understanding how double counting is removed in the overall total of U.S. transportation fatalities and injuries (see *Cross-Modal Comments*, above). The transit data presented in Tables

3-1 and 3-2 are for all incidents covering all four of the major categories of events listed above. Thus, for example, fatalities and injuries arising from a fall in a transit station or tripping while getting off a bus are counted. For more detail, the reader should consult U. S. Department of Transportation, Federal Transit Administration, *Safety Management Information Statistics (SAMIS) Annual Report*.

*Water transport, recreational boats:* U.S. data for fatalities and injuries from recreational boating are based on required reports submitted to the U.S. Coast Guard. Federal regulations (U.S. Code of Federal Regulations 33 (CFR-33,173-4)) require the operator of any vessel that is numbered or used for recreational purposes to submit an accident report when, as a result of an occurrence involving the vessel or its equipment: (1) a person dies, (2) a person is injured and requires medical treatment beyond first aid, (3) damage to the vessel and other property totals more than \$500 or there is a complete loss of the vessel or (4) a person disappears from the vessel under circumstances that indicate death or injury. Although there is no quantitative estimate of the response rate, there may be considerable underreporting, especially of nonfatal accidents, because of the difficulty of enforcing the requirement and because boat operators may be apathetic to, or may not always be aware of, the law.

*Water transport, commercial vessels (passenger and freight):* Data in Table 3-1 and 3-2 include: (a) U.S. flag vessels operating *anywhere in the world* and (b) foreign flag vessels operating within the jurisdiction of the United States (within 12 miles or having an interaction with a U.S. entity, such as a platform within 200 miles or a collision with a U.S. ship.). U.S. territories and protectorates

are included. All deaths and injuries cited result from vessel casualties, such as groundings, collisions, fires or explosions. Fatalities include both people who died and those who were declared missing subsequent to a vessel casualty.

The fatality and injury numbers in Tables 3-1 and 3-2 are taken from marine casualty notifications to the Coast Guard required by the U.S. Code of Federal Regulations (46 CFR 4.05-1) for U.S. flag and foreign vessels, and the subsequent investigation reports. The 1990 data are taken from the casualty maintenance database (CASMAIN) and its personnel casualty table (PCAS). The 1995 and 1996 data are taken from the U.S. Coast Guard Marine Safety Information System (MSIS), and specifically from the Marine Investigations Module. MSIS, which captures marine safety data, is complemented by an analysis database, the Marine Safety Management System (MSMS).

In Tables 3-1 and 3-2, the categories *Commercial Passenger Vessels* and *Commercial Freight Vessels* correspond to the U.S. Coast Guard's categories of *Passenger Vessels* and *Cargo Vessels*, respectively. The Coast Guard defines passenger vessels as: "a vessel that carries passengers for hire domestically, and more than 12 passengers for hire on an international voyage. This includes uninspected passenger vessels, small passenger vessels, passenger and dinner cruise vessels, and cruise ships." The Coast Guard defines cargo vessels as: "a vessel that is engaged in commerce by carrying or facilitating the carrying of cargo. This category includes fishing vessels, but does not include mobile offshore drilling units. A cargo vessel on an international voyage may carry cargo and up to 12 passengers for hire." However, data disaggregated into *Passenger Vessels* and

*Cargo Vessels* were not readily available for this publication.

**Table 3-3**  
**Motor Vehicle Fatality and Injury Rates**  
**Canada**

Table 3-3 is based on the following primary sources:

Fatalities and injuries: Transport Canada. Road Safety and Motor Vehicle Regulation. *Traffic Accident Information Database*. Special tabulation. (Ottawa, Ont.: 1998).

Vehicle-kilometers: Transport Canada. Minister of Public Works and Government Services. *Transportation in Canada 1997—Annual Report*. (Ottawa, Ont.: 1998).

Number of Road Motor Vehicles: Statistics Canada. *Road Motor Vehicles Registrations, Catalogue 53-219-XPB*. (Ottawa, Ont.: various years).

See notes under *Road* for Tables 3-1 and 3-2 for a discussion of how road fatality and injury data are collected. See notes under Table 8-1 for how vehicle-kilometer data are collected. See notes under Table 12-1 for how data on number of road vehicles are collected. Data for 1990, 1995 and 1996 motor vehicle injury and fatality rates per 100 million vehicle-kilometers are based on Transport Canada estimates of vehicle-kilometers traveled by passenger motor vehicles and light trucks during 1995. Estimates of vehicle-kilometers are based on: (1) road motor vehicle fuel sales (net sales on which taxes were paid at road-use rates); (2) estimates of fuel efficiency by class of vehicle; and (3) estimates of average occupancy. Data for motor vehicle injury and fatality rates per 10,000 registered vehicles are based on the number of registered motor vehicles for

1990, 1995 and 1996 and include personal vehicles (personal passenger cars, motorcycles, light trucks) and commercial vehicles.

### **Mexico**

Road motor vehicles: Instituto Nacional de Estadística, Geografía e Informática based on figures from Departamento del Distrito Federal, Dirección General de Autotransporte Urbano; state finance office and state Police and Traffic offices. (Mexico City, D.F.: various years).

Road fatalities and injuries: Instituto Nacional de Estadística, Geografía e Informática. Dirección de Estadísticas Económicas, based on data collected by the Procuraduría General de Justicia del Distrito Federal and the Direcciones de Seguridad Pública y Vialidad or their equivalent agencies at state and local levels. (Mexico City, D.F.: various years).

Secretaría de Comunicaciones y Transportes. Dirección General de Policía Federal de Caminos y Puertos. (Mexico City, D.F.: various years).

### **United States**

Table 3-3 is based on a modification of a similar table published in the U. S. Department of Transportation, Bureau of Transportation Statistics. *National Transportation Statistics 1998 (NTS-98)*. (Washington, DC: 1998) and *National Transportation Statistics 1999 (NTS-990)* (Washington, DC: 1999). This table is based on the following primary sources:

U.S. Department of Transportation, National Highway Traffic Safety Administration, *Traffic Safety Facts 1997*. Washington, DC (November, 1998).

Fatalities: U.S. Department of Transportation.

National Highway Traffic Safety Administration (NHTSA). National Center for Statistics and Analysis. *Fatality Analysis Reporting System (FARS)*. (Washington, DC: 1998).

Injuries: U.S. Department of Transportation. National Highway Traffic Safety Administration (NHTSA). National Center for Statistics and Analysis. *General Estimates System (GES) and Fatality Analysis Reporting System (FARS) 1998*. (Washington, DC: 1998).

#### Vehicle-kilometers:

1990, 1995: U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, Summary to 1995*. (Washington, DC: 1996). Table VM-201A.

1996: U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, 1996*. (Washington, DC: 1997). Table VM-1.

Number of road motor vehicles:

1990: U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, Summary to 1995*. (Washington, DC: 1996). Table VM-201A.

1995 and 1996: U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, 1996*. (Washington, DC: 1997). Table VM-1.

See the notes under *Road* for Tables 3-1 and 3-2. As discussed there, a great deal of effort is devoted to getting a complete and accurate count of road fatalities on public roads. Consequently, the error in the fatality rate is dominated by the error in vehicle-kilometers, which currently can only be roughly estimated. (See notes under Table 12-1 for information on how data on the number of road vehicles are collected, and Table 12-2 for how the data on vehicle-kilometers

are collected.) The level of precision shown in Table 3-3 for the fatality rates is the level reported by the U.S. Department of Transportation National Highway Traffic Safety Administration in their summary document, *Traffic Safety Facts, 1997*.

Because the injury data come from a survey, they are subject to sampling error. See U.S. Department of Transportation, National Highway Traffic Safety Administration, *Traffic Safety Facts 1997*, Appendix C, Table of Standard Errors. For 3,000,000 injuries, the standard error is 5.3 percent.

**Table 3-4**  
**Air Carrier Fatality and Injury Rates**

**All Countries**

In order to forestall invalid conclusions based on the rates alone, standard deviations for the fatal accident rates and the fatality rates are estimated. The standard deviation for the injury rate is more difficult to estimate, and thus has been omitted. The standard deviation is a measure of predictability, assuming the system being measured does not change. If two numbers differ by three standard deviations or more, it can be said, with a very high level of confidence, that the two numbers are in fact different, and that the two systems they describe are in some way different. If two numbers differ by less than one standard deviation, all that can be concluded is that the numbers appear not to be different, and that the systems they describe have not been shown to be different.

*Type of aircraft:* In Table 3-4, and in the discussion that follows, only fatal accidents, fatalities and injuries involving large aircraft are considered. Each country defines the exact meaning of “large aircraft” in the individual country notes below.

*Calculation of standard deviations for fatal accidents (all countries):* There are several ways to estimate the standard deviation of a small number of uncorrelated events (e.g., 27 fatal accidents), using Poisson statistics. The results of the estimates differ somewhat, and the differences increase as the number decreases. In the discussion that follows, the simplest estimate is presented, for the sake of clarity. For the calculation of the standard deviations in the fatal accident rates in Table 3-4, a more sophisticated estimate has been used. However, **all the estimates lead to the same conclusion: the Canadian, U.S. and Mexican fatal accident rates differ by only about one standard deviation, or less.**

*Standard deviation, fatal accidents (United States):* The standard deviation for the number of fatal accidents is approximately plus or minus the square root of the number of fatal accidents. (As noted above, this is a simplification.) In the case of the United States, with 27 fatal accidents in 57 million flight segments, this means that if the air safety system remained unchanged for a very, very long period of time, it would be expected, to a 68 percent confidence level, that the average number of fatal accidents per 57 million flight segments would be between 22 and 32. Twenty-seven fatal accidents in 57 million flight segments gives a fatal accident rate of 0.047 fatal accidents per 100,000 flight segments. The standard deviation in the fatal accident rate is, in percentage terms, the same as the standard deviation in the number of fatal accidents. The square root of 27 is 19 percent of 27, and the standard deviation on the U.S. fatal accident rate of 0.047 is plus or minus (+/-) 19 percent of 0.047, or plus or minus (+/-) 0.009. The standard deviation given in Table 3-4 for the U.S.

fatal accident rate is plus 0.010/minus 0.008. This is a result of a better estimate.

*Standard deviation, fatal accidents (Canada):* The standard deviation on the Canadian fatal accident rate is calculated in the same way as that for the United States. The difference between the simple calculation (standard deviation of +/-0.025) and the better estimate shown in Table 3-4 (+0.031, -0.021) is sizable, because the number of fatal accidents (7) is very small.

*Standard deviation, fatal accidents (Mexico):* The standard deviation on the Mexican fatal accident rate is more complicated to estimate. With only one fatal accident, the simple square root estimate breaks down completely, and with Poisson statistics the standard deviation (technically, the one sigma confidence limit on the mean) becomes highly asymmetric, smaller on the downside and bigger on the upside. In principle, the standard deviation on one fatal accident can be calculated, but has not been done for this table. However, it can be said, with absolute confidence, that the standard deviation on the Mexican fatal accident rate (0.047) based on one fatal accident is not only bigger, but much bigger, than the standard deviation (+0.010, -0.008) on the U.S. fatal accident rate (0.047) based on 27 fatal accidents.

*Calculation of standard deviations for fatality rates (all countries):* **If** all accidents had the same number of fatalities, then the standard deviation on the fatality rate would be, in percentage terms, the same as the standard deviation on the fatal accident rate. That is (to continue with the simplified calculation), if the United States' 922 fatalities had occurred in 27 accidents with 34 fatalities each, then the standard deviation on the fatality rate would be slightly less than 20

percent. (The square root of 27 is 19.2 percent of 27.)

However, in the case of the United States, 16 of the 27 accidents had fewer than 10 fatalities each, and nearly 70 percent of the fatalities occurred in 4 accidents, each of which killed more than 100 people. In the case of Canada, 6 of the 7 fatal accidents had fewer than 10 fatalities each; the seventh claimed 261 lives. In statistical terminology, the number of fatalities is highly correlated with the number of **large** fatal accidents, and the standard deviation on the fatality rate is thus dominated by the standard deviation on the rate of **large** fatal accidents. Thus, to calculate the standard deviations on the U.S. and Canadian fatality rates correctly, it would be necessary to calculate the "large fatal accident rates" and their standard deviations for the two countries. This would mean calculating the standard deviation on one large fatal accident for Canada (and on four large fatal accidents for the United States.) This has not been done for this table. Instead, a gross underestimate has been used: that the standard deviation on the fatality rate is the same, in percentage terms, as the standard deviation on the fatal accident rate. When this is done, the U.S. and Canadian fatality rates differ by about one standard deviation. To repeat: the actual standard deviations are much larger than this crude estimate, and so **the Canadian and U.S. fatality rates differ by less than one standard deviation.**

Mexico had no large fatal air accidents during the 4-year period for which it has data, and therefore, a standard deviation for the Mexican fatality rate has not been estimated, for this table. **Without a standard deviation, no statistically meaningful comparison can be made between the Mexican fatality rate and the U.S. or Canadian**

**fatality rate.** In statistical terms, the “large fatal accident rate” for Mexico is **not** zero, but is smaller than some number to a given level of confidence, and can, in principle, be calculated from Poisson statistics. That is, even though Mexico had no large fatal accidents in 4 years and over 2 million flight segments, it cannot be stated that Mexico will never have a large fatal accident. If the U.S. data are examined, it can be seen that there have been several periods when the United States had no large fatal accidents. For example, in 1993 the United States had no large fatal accidents, and over 8 million flight segments were flown. In 1997 and 1998, the United States had no large fatal accidents, and over 20 million flight segments were flown during those 2 years. During the 1990 to 1996 period, Canada had only one large fatal accident (in 1991), and thus has gone at least 5 years and over 7 million flight segments without a large fatal accident. Even if the standard deviation (i.e., the one sigma confidence limit on the mean) for the Mexican “large fatal accident rate” were estimated, a series of assumptions would have to be made to estimate the corresponding standard deviation on the fatality rate, and this would be statistically questionable. Thus, this calculation has not been attempted.

### Canada

Table 3-4 is based on the following primary sources:

Air Carrier Fatal Accidents, Fatalities and Injuries: Transportation Safety Board of Canada. Special tabulation. (Ottawa, Ont.: 1998).

Air Carrier Flight Operations: Transport Canada. Economic Analysis Directorate. (Ottawa, Ont.: 1998).

The Canadian air carrier data in Table 3-4 differ from the air carrier data in Tables 3-1 and 3-2. The air carrier data in Tables 3-1 and 3-2 present combined fatality and injury data for Canadian air carriers, commuter aircraft and air taxis/specialty aircraft. (See definitions under Tables 3-1 and 3-2.) Table 3-4 presents fatality, injury and flight segment data *only* for airliners (as defined by the Transportation Safety Board of Canada) that are operated by Canadian Level I and II air carriers. Canadian Level I and Level II operators include all air carriers that, in each of the 2 calendar years immediately preceding the report year, transported at least 50,000 revenue passengers or at least 10,000 metric tons of revenue goods. In Tables 3-1, 3-2 and 3-4, Canadian data cover only Canadian registered aircraft operated by Canadian carriers, and include both domestic and international flights, both scheduled and nonscheduled operations, and both passenger and all-cargo flights. Accidents that result in fatalities on the ground, but not on the aircraft, are not counted as fatal accidents. Fatalities and injuries on the ground are not counted. Also see the definitions of aviation accidents, fatalities and serious injuries for Tables 3-1 and 3-2.

### Mexico

Secretaría de Comunicaciones y Transportes. Dirección General de Aeronáutica Civil. (Mexico City, D.F.: 1998).

Aeropuertos y Servicios Auxiliares. (Mexico City, D.F.: 1998).

*Number of fatal accidents, fatalities and injuries:* Data include only commercial aircraft that are operated by Mexican flag carriers, and that have 30 seats or more, or an equivalent freight capacity. Both domestic and international flights are included.

*Flight segments:* The number of flight operations was estimated as the sum of take-offs plus landings divided by two, for scheduled and nonscheduled commercial aviation, in airports under the administration of Aeropuertos y Servicios Auxiliares. Note that some nonscheduled commercial aviation operations are performed at airports not under ASA's administration. Moreover, some scheduled Mexican aviation operations are performed at airports outside Mexico. These two factors cause the estimate of the number of flight operations to be lower than they actually are, thereby increasing the rates above their true values.

### United States

Table 3-4 is based on a modification of a similar table published in the U.S. Department of Transportation Bureau of Transportation Statistics. *National Transportation Statistics 1998*. (Washington, DC: 1998) and *National Transportation Statistics 1999* (Washington, DC: 1999).

This table is based on the following primary sources:

National Transportation Safety Board. *Annual Review of Aircraft Accident Data*, annual issues and *NTSB Press Release, SB97-03*. (Washington, DC: various years).

National Transportation Safety Board (NTSB). Analysis and Data Division, RE-50. (Washington, DC: 1998).

National Transportation Safety Board. *Aviation Accident Statistics*. Web site: [www.nts.gov/aviation/Stats.htm](http://www.nts.gov/aviation/Stats.htm)

National Transportation Safety Board. *Accident Synopses*. Web site: [www.nts.gov/aviation/Accident.htm](http://www.nts.gov/aviation/Accident.htm)

See also: U.S. Department of Transportation. Federal Aviation Administration. *Statistical Handbook of Aviation 1996*. (Washington, DC: 1997). Chapter 9. Web site: [www.api.hq.faa.gov/handbook/1996/toc96.htm](http://www.api.hq.faa.gov/handbook/1996/toc96.htm)

The air carrier data in this table differ from the air carrier data in Tables 3-1 and 3-2. The data in this table include only commercial aircraft that are operated by U.S. flag air carriers, and that have more than 30 seats or that have a maximum payload capacity of more than 7,500 pounds (3,402 kg). These aircraft are regulated under the U.S. Code of Federal Regulations 121 (14 CFR 121). In contrast, the air carrier data in Tables 3-1 and 3-2 include not only these larger aircraft, but smaller aircraft (commuters and on-demand air taxis) that are regulated under the U.S. Code of Federal Regulations 135 (14 CFR 135). In all three tables, the U.S. data cover only aircraft operated by U.S. flag carriers, and include both domestic and international flights, both scheduled and nonscheduled operations, and both passenger and all-cargo flights. Because the regulations for the larger aircraft differ from the regulations for the smaller aircraft, it is not instructive to combine the two categories in calculating safety rates. It should also be noted that during the research phase of this project, a change in regulations occurred. Since March 20, 1997, 14 CFR-121 began to cover some smaller aircraft (i.e., aircraft with 10 or more seats) that were formerly regulated under 14 CFR-135. This change does not affect the data in this publication, because of its 1996 cutoff.

Also see the notes under *Air* for Tables 3-1 and 3-2. As discussed there, the count of fatal accidents and fatalities is complete and



highly accurate. The exposure data (i.e., the number of flight segments) are based on a 100 percent reporting by the airlines to the U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information. Therefore, statistical fluctuation dominates the standard deviations. (Also see the section on *Calculation of Standard Deviations*, above.)

**SECTION 4: TRANSPORTATION, ENERGY AND THE ENVIRONMENT**

**Table 4-1**  
**Energy Consumption by the Transportation Sector**

**Canada**

Statistics Canada. *Quarterly Report on Energy Supply-Demand in Canada, Catalogue 57-003-XPB*. (Ottawa, Ont.: various editions).

Figures for total energy consumption include renewable energy. Total energy consumption also includes all electricity production, including electrical system energy losses. Data for total transportation energy consumption include fuel used in fisheries and in private trucking, but excludes fuel consumption by public administrations. The electricity component of transportation energy consumption excludes electrical system energy losses. Natural Gas data include gas plants and Natural Gas Liquids (NGLs). Natural gas volumes were converted from units of trillion of cubic feet to units of trillion cubic meters using a conversion factor of 0.02832. Petroleum data include energy from petroleum products. Petroleum data exclude energy derived from crude oil.

**Mexico**

Secretaría de Energía. *Balance Nacional, Energía. 1996*. (Mexico City, D.F.: 1998).

Data on total energy consumption include losses resulting from the transformation of one form of energy to another, self-consumption (principally at electrical power plants), and the transportation, distribution and storage of fuels and electricity. These losses add up to 1.63 exajoules (1990), 1.68 exajoules (1995) and 1.86 exajoules (1996). For each year, consumption of liquefied petroleum gases (LPG) accounts for about 1.5 percent of the total.

**United States**

Table 4-1 is based on a modification of a similar table published in the U.S. Department of Energy, Energy Information Administration's *Annual Energy Review*. This table is based on the following primary sources:

Energy consumption and transportation, total: U.S. Department of Energy. Energy Information Administration. *Annual Energy Review 1997*. (Washington, DC: 1998). Table 2.1

Transportation consumption of natural gas, petroleum and electricity and transportation electrical system losses: U.S. Department of Energy. Energy Information Administration. *Monthly Energy Review, August 1998*. (Washington, DC: 1998). Table 2.5.

Natural gas (trillion cubic meters): U.S. Department of Energy. Energy Information Administration. *Annual Energy Review 1997*. (Washington, DC: 1998). Table 6.6.

Petroleum (million barrels): U.S. Department of Energy. Energy Information Administration. *Annual Energy Review 1997*. (Washington, DC: 1998). Table 5.12b.

*Energy consumption, total*: Data include electrical system losses (production, transmission and distribution). In exajoules, these are 21.5 for 1990; 23.0 for 1995 and 23.7 for

1996. (Data are from the Department of Energy's *Annual Energy Review*, Table 2.1). Total energy consumption also includes renewable energy used by electrical utilities and residential, commercial, industrial users and transportation. The Energy Information Administration (EIA) at the Department of Energy uses the higher heating values (gross heat content) of fossil fuels in arriving at total energy consumption; that is, the energy in the fuel spent vaporizing the water produced by the burning of the fuel is counted.

*Transportation consumption, total:* Data **do not** include electrical system energy losses. In exajoules, these are 0.033 for 1990; 0.028 for 1995 and 0.030 for 1996. The transportation total also includes about 0.1 exajoule each year in the form of ethanol blended into motor gasoline. This is, by far, the largest use of renewables in transportation. (See Table 4-3.) In this table, fisheries are not included in transportation.

*Conversions:* To convert from barrels of petroleum to exajoules: One barrel of petroleum has a heat content of approximately 5.74 billion (thousand million) joules (from the Department of Energy's *Annual Energy Review*, Table A3). To convert from cubic meters of natural gas to exajoules: one cubic meter of natural gas has a heat content of approximately 38.3 million joules (from the Department of Energy's *Annual Energy Review*, Table A4.)

**Table 4-2**  
**Energy Consumption by Mode of Transportation**

### Canada

Table 4-2 is based on the following primary sources:

All modes, except transit rail: Statistics Canada. *Quarterly Report on Energy Supply-Demand in Canada, Catalogue 57-003-XPB*. (Ottawa, Ont.: various quarterly editions).

Natural resources Canada. *Canada's Energy Outlook 1996-2020*. (Ottawa, Ont.: 1998).

Transit rail: Statistics Canada. *Passenger Bus and Urban Transit Statistics, Catalogue 53-215-XPB*. (Ottawa, Ont.: various years).

Air fuel data include sales to foreign carriers, but exclude fuel purchased by Canadian carriers abroad. Data for road, other fuels refer to liquid petroleum gases (LPGs). Rail fuel data are for diesel fuel only. Transit fuel data refer to all urban public transit, including local motor buses, light rail and heavy rail. Data for water transport fuel include fuel sold to fisheries operators. Water data also include sales to foreign carriers, but exclude fuel purchased by Canadian carriers abroad.

### Mexico

Secretaría de Energía. *Balance Nacional, Energía 1996*. (Mexico City, D.F.: 1998).

Comisión Nacional para el Ahorro de Energía. Private communication. (Mexico City, D.F.: 1998).

Starting in 1991, diesel was gradually substituted for residual fuel oil for water transport. As shown by the data in the table, this substitution was almost complete by 1995.

### United States

Table 4-2 is based on the following primary sources:

Total Transportation Energy Consumption: U.S. Department of Energy. Energy Information Administration. *Annual Energy Review 1997*. (Washington, DC: 1998). Table 2.1.

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#### Air:

Jet fuel: U.S. Department of Transportation. Bureau of Transportation Statistics. Office of Airline Information. Private Communication, based on Form 41 Financial Reports submitted by the large certificated air carriers to DOT under CFR 241. (Washington, DC: 1998). (See notes for the definition of “large certificated air carriers.”)

U.S. Department of Transportation. Federal Aviation Administration. *General Aviation and Avionics Survey*. (Washington, DC: various years). Table 5.1.

Aviation gasoline: U.S. Department of Transportation. Federal Aviation Administration. *General Aviation and Avionics Survey*. (Washington, DC: various years). Table 5.1.

#### Road, gasoline and diesel:

*1990, 1995:* U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, Summary to 1995*. (Washington, DC: 1996). Table MF-221.

*1996:* U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, 1996*. (Washington, DC: 1997). Table MF-21.

Road, other fuels: U.S. Department of Energy. Energy Information Administration. *Alternatives to Traditional Transportation Fuels, 1996*. (Washington, DC: 1997). Table 10.

Pipeline: U.S. Department of Energy. *Natural Gas Annual 1996*. (Washington, DC: 1997). Table 101 and similar tables in earlier editions.

Freight rail: Association of American Railroads. *Railroad Facts, 1997 Edition*. (Washington, DC: 1997). Page 40.

#### Intercity passenger rail:

*1990:* National Railroad Passenger Corp. State and Local Affairs Department. Private Communication. (Washington, DC: 1998).

*1995, 1996:* National Railroad Passenger Corp. Director of Fuel Management. Private Communication. (Washington, DC: 1998).

Transit rail: American Public Transit Association. *Transit Fact Book*. (Washington, DC: various years).

American Public Transit Association. Private Communication. (Washington, DC: 1998).

#### Water transport:

Residual and distillate/diesel fuel oil: U.S. Department of Energy. Energy Information Administration. *Fuel Oil and Kerosene Sales*. (Washington, DC: various years). Tables 2 and 4 and similar tables in earlier editions.

Gasoline: U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, 1996*. (Washington, DC: 1997). Table MF-24 and similar tables in earlier editions.

Total fuel consumption: Data differ from the sum of the rows, because the total comes from the U.S. Department of Energy, which is more inclusive than the U.S. Department of Transportation, the source of much of the individual modal data in the table. The total is larger than the sum of the modal categories in Table 3-2 by 1.44 exajoules in 1996; by 1.37 exajoules in 1995; and 1.55 exajoules in 1990.

There are two second-order corrections to these discrepancies. First, fuel consumed by local transit buses and other road transit vehicles is reported both under road and under transit. For each year, this *increases* the discrepancy by roughly 0.1 exajoules. Second, U.S. data are unavailable for the amount of electricity and diesel used to

transport the contents of pipelines. Using the Canadian pipeline data as a guide, including pipeline electricity and diesel for the U.S. would *reduce* the discrepancy by roughly 0.1 exajoules (including energy system losses) for each of the 3 years. Thus, these two second-order corrections are both small, are in the opposite direction, and can therefore be neglected.

A rigorous reconciliation between the Department of Energy and Department of Transportation data is beyond the scope of these notes. However, DOE's *Annual Energy Review*, Table 5.12b reports jet fuel consumption of 3.32 exajoules for 1990, 3.30 exajoules for 1995 and 3.46 exajoules for 1996. These are between 1.4 and 1.5 exajoules larger than the jet fuel numbers in Table 4-2, almost exactly the amount of the discrepancy. The DOE figures include jet fuel consumed by the military, by other federal agencies, by foreign carriers fueling in the U.S. and by all U.S. air carriers, not just those meeting the definition of a "large certificated carrier." (See Air, below, for a more complete definition of what is included under jet fuel in Table 4-2.)

Other items are left out of the individual modal numbers in Table 4-2. Nonclass I rail is not included, nor are electrical system losses for rail and transit. Military use of gasoline is left out of the road category in Table 4-2. (Federal civilian use of gasoline is included, as are state, county and municipal use.) Nor are losses arising from the evaporation and handling of road gasoline included in the road category in Table 4-2. All governmental use of diesel road fuel is left out of FHWA's category "Special Fuels," and thus is left out of Table 4-2. All of these together probably add up to less than 0.5 exajoules. (See *NTS-99*, Table 4-19 and he

*Annual Energy Review-1997*, Tables 1-12 and 1-13 for data on military use of energy.)

*Air, jet fuel:* Data include *only* jet fuel consumed by the large certificated carriers *in their domestic operations*, plus on-demand air taxis and general aviation. Large certificated carriers account for 95 percent to 96 percent of the jet fuel reported in Table 4-2. A *large certificated air carrier* is an air carrier "holding a certificate issued under Section 401 of the Federal Aviation Act of 1958, as amended, that: (1) operates aircraft designed to have a maximum passenger capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds [8,165 kg]; or (2) conducts operations where one or both terminals of a flight stage are outside the 50 states of the United States, the District of Columbia, the Commonwealth of Puerto Rico and the U.S. Virgin Islands." The large certificated air carriers are divided into four groups, according to operating revenue: Majors, Nationals, Large Regionals and Medium Regionals. The jet fuel data in Table 4-2 exclude the Medium Regionals, small certificated air carriers, scheduled commuters, foreign airliners fueling in the United States, the military and other governmental users.

*Road:* Gasoline includes private, commercial and governmental use, with the exception of the military. The Federal Highway Administration's category "Special Fuels" appears to exclude civilian government and military use. (See *Highway Statistics*, cited above.) More than 99 percent of FHWA's category "Special Fuels" is diesel. Data for the category "Other Fuels" in Table 4-2 are taken directly from the "Total Alternative Fuels" category of Table 4-3; the conversion factor used is that for gasoline, because the data in Table 4-3 are stated as gasoline-equivalent liters.

*Transit:* Data cover all transit, including local transit buses and other road transit vehicles, which also are reported under Road. Some ferryboats, however, are not included. (Web site: [www.apta.com/](http://www.apta.com/), click on Statistics.) For 1995 and 1996, the entry “Gasoline” includes all nondiesel fuels, except for compressed natural gas (CNG). (On a volume basis, gasoline accounted for about 70 percent of the entry “Gasoline” in 1995 and 1996.) For 1990, the entry “Gasoline” includes only gasoline.

*Conversion factors:* See NTS-99, Table 4-6 for the volume-to-energy conversion factors. The NTS conversion factors are in U.S. measurements (BTUs per gallon). Multiply the factors by 278.7 to get joules per liter.

**Table 4-3**  
**Estimated Consumption of Alternative and Replacement Fuels for Road Motor Vehicles**

**Canada**

Natural Resources Canada. Office of Energy Efficiency. (Ottawa, Ont.: 1998).

**Mexico**

The principal alternative fuel in Mexico for the years reported is liquified petroleum gases (LPG). As a motor fuel, LPG is used mainly in cities by commercial light-duty trucks, as a result of private custom-fitting.

**United States**

Table 4-3 is taken from the following primary source, with only a change from gallons to liters: U.S. Department of Energy. Energy Information Administration. *Alternatives to Traditional Transportation Fuels, 1996*. (Washington, DC: 1997). Table 10.

*Fuel consumption, total:* The total represents the sum of alternative fuels, gasoline and diesel. The oxygenates are included in gasoline.

*Methanol and ethanol:* The remaining portion of 85-percent methanol and both ethanol fuels is gasoline. Consumption data include the gasoline portion of the fuel.

*MTBE:* Data include a very small amount of other ethers.

*Gasoline:* Data include MBTE and ethanol in gasohol.

*Data definitions and sources:* In the United States, the definitions for alternate fuels and replacement fuels are set by Section 301 of the Energy Policy Act of 1992, and are summarized in the annual U.S. Department of Energy, Energy Information Administration publication, *Alternatives to Traditional Transportation Fuels*.

In Table 4-3, U.S. fuel quantities are expressed as gasoline-equivalent liters (gallons) to allow direct comparisons among different types of fuel. According to *Alternatives to Traditional Transportation Fuels*, the gasoline equivalent is computed by dividing the lower heating value of the alternative fuel by the lower heating value of gasoline and multiplying the quotient by the volume of alternative fuel consumed. Lower heating value is the joule content per unit of fuel, excluding the heat produced by condensation of water vapor in the fuel.

Table 4-3 is taken *directly* from *Alternatives to Traditional Transportation Fuels*, with only a simple conversion from gallons to liters. *Alternatives to Traditional Transportation Fuels* describes in some detail how consumption values for the various alternative fuels are calculated. Briefly, the consumption of alternative fuels in a given year is estimated

from the numbers of different kinds of alternative-fueled vehicles in operation in that year, the annual average vehicle-miles-traveled (vmt) for equivalent conventional vehicles, and estimates of fuel efficiency. The vmt is adjusted downward for the alternative fueled vehicles, to allow for less intensive use of alternative-fueled vehicles relative to conventional vehicles.

Oxygenate consumption is “estimated from production, net imports and stock change data from the Department of Energy’s *Petroleum Supply Monthly*. *Petroleum Supply Monthly* compiles data from the Monthly Petroleum Supply Reporting System, a series of surveys that collect data from refiners, importers and transporters of crude oil and petroleum products. Oxygenate data also are collected on DOE’s *Monthly Oxygenate Telephone Report*.

For Table 4-3, the Energy Information Administration at DOE took gasoline and diesel consumption from the *EIA Petroleum Supply Annual, Volume 1* (June 1997). Highway use of gasoline was estimated as 97.1 percent of total gasoline use, and highway use of diesel was estimated as 52.1 percent of total diesel consumption.

*Differences with Table 4-2:* The values for road gasoline and road diesel in Table 4-3 differ slightly from the values in Table 4-2. (See the notes under Table 4-2 for a brief description of the origin of the numbers in Table 4-2.) When the values in Table 4-2 are expressed in volume terms, road gasoline is 1.5 percent higher in Table 4-2 than in Table 4-3 for 1996 and 1.0 percent higher for 1995. The values for road diesel also differ slightly between the two tables. (Note that diesel in Table 4-3 is in gasoline-equivalent volume units, not in actual volume of diesel fuel.)

**Table 4-4**  
**Average Price of Fossil Fuel to End-Users**

(Current U.S. cents per liter)

#### **Canada**

Natural Resources Canada. Office of Energy Efficiency. (Ottawa, Ont.: 1998).

#### **Mexico**

Petróleos Mexicanos. *Anuario Estadístico, 1998*. (Mexico City, D.F.: 1999).

Petróleos Mexicanos. PEMEX-Refinación. Subgerencia de Planeación (Mexico City, D.F.: 1999)

For further information, see: *Tasas para el Cálculo del Impuesto Especial sobre Producción y Servicios para la Enajenación de Gasolinas y Diesel* (*The Federal Register, Rates to Estimate the Special Tax on Production and Services for the Sale of Gasoline and Diesel*); and the *Ley del Impuesto Especial sobre Producción y Servicios* (*Special Tax on Production and Services Act*).

All prices are those in effect at the end of December of each year. At present there are 86 authorized fuel dealer stations in Mexico. Each month, the Secretaría de Hacienda y Crédito Público publishes in the *Diario Oficial de la Federación* (*Federal Register*) the rates relative to the Impuesto Especial sobre Producción y Servicio (Special Tax on Production and Services) for the sale of gasoline and diesel. The rates range from 25-30 percent on average.

After the Special Tax Rate is added to the reference price, the Value Added Tax (VAT) is added. For some gas stations, the VAT is 10 percent; for others it is 15 percent. The sum of the reference price, the Special Tax and the VAT becomes the price at the gas station.

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## United States

Table 4-4 is based on the following primary sources:

Motor vehicle fuel: U.S. Department of Energy. Energy Information Administration. *Annual Energy Review 1997*. (Washington, DC: 1998). Table 5.22.

Motor vehicle fuel taxes: U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, Summary to 1995*. (Washington, DC: 1996). Tables FE 101A, MF 205 and MF 202.

U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, 1996*. (Washington, DC: 1997). Tables FE 101A, MF-205, MF-121T (second page) and MF2.

### Aviation fuel:

Gasoline: U.S. Department of Energy. Energy Information Administration. *Annual Energy Review, 1997*. (Washington, DC: 1998). Table 5.20.

Jet fuel: U.S. Department of Transportation. Bureau of Transportation Statistics. Office of Airline Information. Private Communication, based on Form 41 Financial Reports submitted by the large certificated air carriers to DOT under CFR-241. (See notes for Table 4-2 for the definition of “large certificated air carriers.”) (Washington, DC: 1998).

See also: U.S. Department of Energy. Energy Information Administration. *Annual Energy Review, 1997*. (Washington, DC: 1998). Table 5.20.

Rail fuel: Association of American Railroads. *Railroad Facts, 1997 Edition*. (Washington, DC: 1997). Page 60.

Rail fuel taxes: Association of American Railroads. Private Communication. (Washington, DC: 1998).

Water transport: U.S. Department of Transportation. Maritime Administration (MARAD). Private Communication, based on reports from major U.S. flag liner operators to MARAD. (Washington, DC: 1998).

For information on U.S. federal fuel taxes, see: U.S. Internal Revenue Service, *Fuel Taxes* at [www.irs.ustreas.gov/prod/forms\\_pubs/pubs/p51005.htm](http://www.irs.ustreas.gov/prod/forms_pubs/pubs/p51005.htm)

*Data sources for road gasoline and diesel and aviation gasoline:* For more information on methods of data collection and a discussion of sources and sizes of errors, see U.S. Department of Energy, Energy Information Administration, *Weekly Petroleum Status Report*, Appendix A, available through Department of Energy’s Energy Information Administration’s web site: [www.eia.doe.gov](http://www.eia.doe.gov)

*Motor vehicle fuel, gasoline and diesel:* Average gasoline prices by grade are calculated by the U.S. Department of Energy, Energy Information Administration (EIA) “from a sample of service stations providing all types of service (i.e., full-, mini- and self-service) and geographic coverage for 85 urban areas.” The averages are simple annual averages of monthly data from the U.S. Department of Labor, Bureau of Labor Statistics, *Consumer Prices: Energy*.

Diesel prices are derived from an EIA telephone survey of a selected sample of 350 retail on-highway diesel fuel outlets. The survey is from *EIA-888, On-Highway Diesel Fuel Price Survey*. According to the EIA, the average prices are calculated from pump prices, and therefore include all taxes, federal and state, plus state sales taxes for those states that have sales taxes on road fuel.

All 50 states, plus the District of Columbia, have a per-gallon tax on both road gasoline and road diesel, but only a few states have a

sales tax on these fuels. See *Highway Statistics 1996*, Table MF 121T for state per-gallon and sales taxes on road gasoline, diesel, LPG and gasohol, and for information on the special provisions some states apply to some road fuel users. Furthermore, some users are exempt from federal road fuel taxes; others pay a reduced rate. See *Highway Statistics 1996*, Table FE101A for exemptions and reductions to the federal road fuel tax.

*Road gasoline and diesel taxes:* Gasoline and diesel taxes for 1990, 1995 and 1996 are provided in the two tables below. In 1998, the federal fuel taxes on road gasoline and road diesel were 18.4 cents per gallon (4.9 cents per liter) and 24.4 cents per gallon (6.4 cents per liter), respectively.

<u>Gasoline taxes</u>						
<u>(Cents per gallon)</u>			<u>(Cents per liter)</u>			
	Federal	State*	Total	Federal	State*	Total
1990	**9.1	15.47	24.57	**2.4	4.1	6.5
1995	18.4	18.50	36.90	4.9	4.9	9.7
1996	18.3	18.67	36.97	4.8	4.9	9.8

\* State tax rates as of December 31st of each year. Weighted average based on net gallons taxed.

\*\* Applies to the first 11 months of 1990. Taxes went up by 5.0 cents per gallon (1.3 cents per liter) for both gasoline and diesel on December 1, 1990.

<u>Diesel taxes</u>						
<u>(Cents per gallon)</u>			<u>(Cents per liter)</u>			
	Federal	State*	Total	Federal	State*	Total
1990	**15.1	16.00	31.10	**4.0	4.2	8.2
1995	24.4	18.98	43.38	6.4	5.0	11.5
1996	24.3	18.99	43.29	6.4	5.0	11.4

\* State tax rates as of December 31st of each year. Weighted average based on net gallons taxed.

\*\* Applies to the first 11 months of 1990. Taxes went up by 5.0 cents per gallon (1.3 cents per liter) for both gasoline and diesel on December 1, 1990.



*Aviation fuel, gasoline:* Data for aviation fuel gasoline represent the sales price to end-users. Prices are collected through the Energy Information Administration's 782A Survey, which "consists of a census of respondents who either directly or indirectly control a refinery or gas plant facility. As of October 1998, 155 companies respond to the EIA-782A survey. The survey results are reported in EIA's *Refiners'/Gas Plant Operators' Monthly Petroleum Product Sales Report*. The data on aviation fuel in Table 4-4 do not include any taxes. The federal tax on aviation gasoline in 1998 was 5.1 cents per liter (i.e., 19.4 cents per gallon).

*Aviation fuel, jet fuel:* The data are the basic cost of fuel reported to the DOT by the large certificated air carriers for their domestic operations. These carriers are defined under *Air* in technical notes for Table 4-2. Federal taxes are not included, nor are state taxes, nor are the "into-plane fees" (which are servicing charges by the fueling company). The federal tax on aviation fuel ("other than gasoline or diesel fuel") in 1998 was 5.8 cents per liter (i.e., 21.9 cents per gallon), but, the tax was reduced to 1.2 cents per liter (i.e., 4.4 cents per gallon) to commercial airlines meeting certain specifications and the tax was not applied to domestic air carriers engaged in foreign trade or trade between the United States and any of its territories. There are also other exemptions, reductions and special provisions. For more information, see the U.S. Internal Revenue Service publication *Fuel Taxes* at [www.irs.ustreas.gov/prod/forms\\_pubs/pubs/p51005.htm](http://www.irs.ustreas.gov/prod/forms_pubs/pubs/p51005.htm)

*Rail fuel, diesel:* The numbers in Table 4-4 are the costs of diesel fuel to the Class I freight railroads, as reported by the railroads. In 1996, the Class I railroads had operating rev-

enues of \$255.0 million or more. Although Class I railroads comprise only 2 percent of the number of railroads in the U.S., they accounted for 91 percent of railroad freight revenues in 1996. The data in Table 4-4 include federal taxes as follows:

- 1990: 0.10 cents per gallon through 11/30/90 (0.03 cents per liter)  
2.60 cents per gallon remainder of 1990 (0.69 cents per liter)
- 1995: 6.90 cents per gallon through 9/30/95 (1.82 cents per liter)  
5.65 cents per gallon remainder of 1995 (1.49 cents per liter)
- 1996: 5.55 cents per gallon (1.47 cents per liter)

State fuel taxes are not included in the railroad data in Table 4-4. The railroads are not required to report state fuel taxes as such, and summary data are not available because of the great variety of state levies on rail diesel fuel.

*Water transport, combined fuels:* The data in Table 4-4 include taxes for maritime fuel, but the federal tax is applied only in restricted circumstances. In 1998, the federal tax was 6.4 cents per liter (i.e., 24.4 cents per gallon) and "is imposed on any liquid fuel used in the propulsion system of commercial transportation vessels while travelling on certain inland and intracoastal waterways. The tax generally applies to all types of vessels, including ships, barges and tugboats." The fuel tax waterways are defined in Section 206 of the Inland Waterways Revenue Act of 1978 (P.L. 95-502), as amended by the Water Resources Development Act of 1986 (P.L. 96-662). Fuel tax waterways comprise 10,867 miles of commercially significant shallow draft inland waterways. Certain types of

transportation on these fuel-tax waterways are excluded from the tax. The IRS publication *Fuel Taxes* explains when the following are exempt: fishing vessels; deep-draft (more than 12 feet) ocean-going vessels; passenger vessels; ocean-going barges; and vessels operated by state, local and Indian tribal governments. For more detail, see *Fuel Taxes*.

**Table 4-5**  
**New Model Year Fuel Efficiency for**  
**Road Motor Vehicles**

**Canada**

Table 4-5 is based on the following primary sources:

Sales weighted averages: Transport Canada. *Transportation in Canada, 1997–Annual Report, TP 13198*. (Ottawa, Ont.: 1998).

Ranges: Natural Resources Canada. *Canada's Energy Outlook 1996-2020*. (Ottawa, Ont.: 1997). Transport Canada and Natural Resources Canada. *Fuel Consumption Guide, Annual*. (Ottawa, Ont.: various years).

**Mexico**

Secretaría de Energía. Comisión Nacional para el Ahorro de Energía, Dirección de Transporte. (Mexico City, D.F.: 1998).

Data are estimates from the Transportation Directorate of the Comisión Nacional para el Ahorro de Energía (National Commission for Energy Conservation).

**United States**

Table 4-5 is based on the following primary sources:

Sales weighted average new vehicle fuel efficiency (model year production):

U.S. Department of Transportation. National Highway Traffic Safety Administration

(NHTSA). Consumer Programs Division, NPS-32. (Based on the U.S. Environmental Protection Agency's Calculations of Final Fuel Economy for NHTSA). (Washington, DC: 1998).

U.S. Department of Transportation. National Highway Traffic Safety Administration (NHTSA). Automotive Fuel Economy Program. *Twenty-second Annual Report to Congress (Calendar Year 1997)*, and previous years. (Washington, DC: various years).

Ranges: U.S. Department of Transportation. National Highway Traffic Safety Administration (NHTSA). Consumer Programs Division, NPS-32. Private Communication. (Washington, DC: 1998).

New vehicle fuel efficiency: background: The U.S. Congress mandated the setting of fuel efficiency standards for new passenger cars and light trucks in the Energy Policy and Conservation Act (EPCA) of 1975 (49 USC 329). (Light trucks are defined for this purpose as 3,856 kg gross vehicle weight rating or less—i.e., 8,500 pounds or less.) These are the Corporate Average Fleet Economy (CAFE) standards. The Congress set specific numbers for the standards for 1985 and beyond (and for several earlier years) for passenger cars, but left the standards for light trucks to the discretion of the Department of Transportation (DOT). EPCA also gave DOT the authority to alter the standards for passenger cars.

To summarize, Congress assigned authority to DOT to: (1) set fuel efficiency standards for light trucks, (2) alter standards for passenger cars and (3) collect fines from manufacturers. Congress assigned this authority to DOT rather than to the Department of Energy (DOE) or the Environmental Protection Agency (EPA) because DOT already regulated the safety aspects of motor vehicles, and

Congress was concerned that the drive for high fuel economy would impact safety. Thus, Congress decided that fuel economy and safety should be regulated by the same agency. DOT then assigned fuel efficiency regulation to the National Highway Safety Administration (NHTSA) because NHTSA was the only modal administration that regulated light motor vehicles.

*New vehicle fuel efficiency numbers in Table 4-5:* The sales-weighted averages for the model year production were calculated by EPA for NHTSA, using sales figures from the manufacturers, mileage test values from the manufacturers, and the results of EPA's own mileage tests. EPA also monitors the mileage-testing programs of the manufacturers. The tests are performed on fully assembled cars, using dynamometers (i.e., not on-road tests), with a program that simulates a defined road course. The averages assume 55 percent city and 45 percent highway mileage. The averages include both domestic and imported vehicles. For more data and information, see U.S.DOT/NHTSA Automotive Fuel Economy Program, *Annual Report to Congress*.

*Ranges:* The lowest-fuel-economy and highest-fuel economy values are not the fuel economies for an entire car-line, but only for a specific engine and transmission option. Both domestic and imported vehicles are represented in the extreme values. Only gasoline-fueled vehicles are represented in the extreme values; for 1996, a light truck capable of running on compressed natural gas had a calculated *gasoline* fuel economy of 1.6 liters/100 km, but this vehicle was omitted from the ranges reported in this table.

## **Tables 4-6a and 4-6b Federal Emission Control Requirements for Passenger Cars and Light Trucks: Model Year**

### **Federal Emission Control Requirements for Heavy Trucks: Model Year**

#### **Canada**

Tables 4-6a and 4-6b are based on the following primary source: Transport Canada. Road Safety and Motor Vehicle Regulations Directorate. (Ottawa, Ont.: 1998).

#### **Mexico**

Instituto Nacional de Ecología. *Diario Oficial de la Federación. Norma Oficial Mexicana. NOM-042-ECOL-1993*. (Mexico City, D.F.: 1993).

Secretaría de Medio Ambiente, Recursos Naturales y Pesca. *Diario Oficial de la Federación. Norma Oficial Mexicana NOM-076-ECOL-1995*. (Mexico City, D.F.: 1995).

*Emission standards, background:* For passenger cars and light-duty trucks, the data in this table are from the *Mexican Official Standard* NOM-042-ECOL-1993, which sets forth the maximum allowable levels for nonburned hydrocarbons, carbon monoxide and nitrogen oxides emitted from the exhaust pipe of new motor vehicles at the assembly plant. This standard also sets the limit for evaporative hydrocarbons coming from fuel systems using gasoline, liquefied petroleum gas (LPG), natural gas and some other alternative fuels. This standard applies to vehicles with a gross vehicle weight of 400 kg to 3,857 kg. The standard was issued by the Instituto Nacional de Ecología (National Environmental Institute) in the *Diario Oficial de la Federación* (Federal Register) on October 22, 1993. The standard is available at [www.ine.gob.mx/dgra/normas/cont\\_at/vehiculos/no\\_42.htm](http://www.ine.gob.mx/dgra/normas/cont_at/vehiculos/no_42.htm).

*Heavy trucks:* For new diesel fueled heavy trucks (i.e., gross weight over 3,857 kilograms), NOM-044-ECOL-1993 sets the maximum allowable levels for the emission from the exhaust pipe of hydrocarbons, carbon monoxide, nitrogen oxides, total suspended particulates and opacity of the smoke. The standard was issued by the Instituto Nacional de Ecología (National Environmental Institute) in the *Diario Oficial de la Federación* (Federal Register) on October 22, 1993. The standard is available at [www.ine.gob.mx/dgra/normas/cont\\_at/vehiculos/no\\_44.htm](http://www.ine.gob.mx/dgra/normas/cont_at/vehiculos/no_44.htm).

For new spark-ignition heavy trucks (i.e., gross vehicle weight over 3,857 kg), NOM-076-ECOL-1995 sets the maximum allowable levels for the emission of nonburned hydrocarbons, carbon monoxide and nitrogen oxides coming from the exhaust pipe, as well as evaporative hydrocarbons coming from the fuel system. This standard applies to gasoline, LPG, natural gas and other alternative fuels. The standard was issued by the Secretaría del Medio Ambiente, Recursos Naturales y Pesca (Secretariat of Environment, Natural Resources and Fisheries) in the *Diario Oficial de la Federación* (Federal Register) on December 26, 1995. The standard is available at [www.ine.gob.mx/dgra/normas/cont\\_at/vehiculos/no\\_76.htm](http://www.ine.gob.mx/dgra/normas/cont_at/vehiculos/no_76.htm)

*Passenger cars and light-duty trucks:* Mexico does not regulate the emission of particulates for passenger cars and light duty trucks.

### United States

Table 4-6a and 4-6b are based on the following primary sources:

Passenger cars and light trucks: *U.S. Code of Federal Regulations*. (Washington, DC: 1998). 40 CFR86.094-8 and 40 CFR86.094-9.

U.S. Environmental Protection Agency. Office of Air and Radiation. *Mobile Source Emissions Standards Summary*. (Washington, DC: 1992).

U.S. Environmental Protection Agency. Office of Air and Radiation. Office of Mobile Sources, Vehicle Programs and Compliance Division. *Tier 2 Study White Paper*. (Washington, DC: 1997). Web site: [www.epa.gov/orcdizux/t2paper.htm](http://www.epa.gov/orcdizux/t2paper.htm)

Heavy trucks: U.S. Environmental Protection Agency. Office of Air and Radiation. *Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines* (EPA420-F-97-014) September 1997. (Washington, DC: 1997).

U.S. Environmental Protection Agency. Office of Air and Radiation. *Mobile Source Emissions Standards Summary*. (Washington, DC: 1992).

Supplementary reference on mobile source emissions standards: <http://www.epa.gov/oms/stds-ld.htm> (A summary of Federal and California Light-Duty Exhaust Emission Standards)

*Emission standards, background:* Tightened emissions standards for new cars and light trucks (commonly referred to as the “Tier One Standards”) began to be phased in for model-year 1994, as called for in the 1990 Clean Air Act Amendments. (Phase-ins for some standards and some categories of light trucks began later. See the *U.S. Code of Federal Regulations* or the *National Transportation Statistics (NTS)-99*. The U.S. emission standards presented in Table 4-6a are a simplified version of the Tier One emission standards. The 1996 Canadian standards, according to their note on Table 4-6a, are the U.S. standards of 1988-1993 (Tier Zero standards).

The U.S. emission standards have a long and complex history, dating back over three decades. The current and historical standards are presented in detail in the *NTS-99*. The tables in the *U.S. Code of Federal Regulations*

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summarize the Tier 0 and Tier 1 standards, and cover not only gasoline and diesel-fueled cars and light trucks, but also methanol, natural gas and LPG-fueled vehicles. In addition, the Environmental Protection Agency's *Mobile Source Emissions Standards Summary* (full citation above) provides even more historical information, including detailed notes on exemptions and special provisions such as emissions averaging and high altitude standards. For emission standards for methanol, natural gas and LPG-fueled vehicles, see the *U.S. Code of Federal Regulations*. Detailed notes are not provided here on the emission standards and definitions for heavy trucks. For additional information on emissions standards of heavy trucks, see the references listed above and see web site: [www.epa.gov/omswww](http://www.epa.gov/omswww).

*Emission testing procedures:* Manufacturers test preproduction prototypes of new vehicle models in order to certify that the vehicles meet the federal emission standards. The manufacturers submit the test results to the Environmental Protection Agency, which confirms the accuracy of the figures they supply. The vehicles, which are fully assembled, are driven by a professional driver under controlled laboratory conditions, on a device similar to a treadmill. The test used to measure emissions simulates a 7.5-mile (12-kilometer), stop and go trip with an average speed of 20 miles per hour (32 kilometers per hour). The trip takes 23 minutes and has 18 stops. About 18 percent of the time is spent idling. Both cold engine starts and hot engine starts are included in the test. For more information on test protocols, go to [www.epa.gov/omswww](http://www.epa.gov/omswww).

*Implementation schedules:* For passenger cars, the Tier 1 standards were phased in at a rate of 40 percent for model-year 1994, 80 per-

cent for model year 1995 and 100 percent for model year 1996. The same schedule applies to LTD2, with the exception of particulates, which were phased in at a rate of 40 percent for 1995, 80 percent for 1996 and 100 percent for 1997. The rates apply to each motor vehicle manufacturer. For the implementation schedules for LDT1, LDT3 and LDT4, see *NTS-99* or the *U.S. Code of Federal Regulations*. (LDT refers to light duty trucks.)

*Useful life:* Useful life refers to the time or mileage over which the standards must be met. Motor vehicle manufacturers are required to produce cars and trucks that meet the standards for the specified years/miles. Consider the case of passenger cars: the vehicle must meet the first set of standards for 5 years or 50,000 miles, whichever comes first, and then the second set of standards for 10 years or 100,000 miles, whichever comes first. If there is no intermediate useful life standard (an example is the case of Nitrogen Oxide for diesel LDT2s (see below)), then the full useful life standard applies immediately. EPA checks that the vehicles are meeting the emissions standards for the intermediate and full useful lives through a program of recalls and testing. After the full useful life is met, federal emissions standards do not apply. However, as part of their inspection and maintenance procedures, the individual states may choose to require cars that have passed their full useful life (as defined by the federal emissions standards) to meet some kind of emissions standards. This would be part of a state's efforts to meet ambient air quality standards in local areas.

For the Tier 1 Standards (i.e., the U.S. standards in Table 4-6a), the useful lives are as follows:

Passenger cars and LDT1 and LDT2 light trucks:

Intermediate useful life: 5 years/ 50,000 miles

Full useful life: 10 years/100,000 miles (10 years/161,000 kilometers)

(See *NTS-99* for the useful lives for the Tier 0 standards and for the Tier 1 standards for LDT3 and LDT4 trucks. For the useful lives of heavy trucks, see U.S. Environmental Protection Agency, Office of Air and Radiation, *Emission Standards Reference Guide for Heavy-Duty and Nonroad Engines* (EPA420-F-97-014) (September 1997) or the *NTS-99*.)

*Passenger cars and light trucks, data coverage and definitions:* Table 4-6a presents only the standards for *gasoline-fueled* passenger cars and light trucks. Moreover, the table presents standards *only for one of the four classes of light trucks*, LDT2. The standards for *diesel-fueled light vehicles* differ from those in Table 4-6a as follows:

*Passenger cars, nitrogen oxides:* The standards are 0.62 g/km for intermediate useful life (i.e., the Tier 0 standard remains in force) and 0.78 g/km for full useful life.

*Light trucks, nitrogen oxides, intermediate useful life:* No nitrogen oxide standard for LDT2. (However, the full useful life nitrogen oxide standard in Table 4-6a *does* apply to diesel-fueled LDT2s.)

*Cold-temperature carbon monoxide:* Standards do not apply to diesel-fueled passenger cars or light trucks. (The *Cold-Temperature Carbon Monoxide* standard is measured at 20 degrees Fahrenheit (minus 7 degrees Centigrade) rather than 75 degrees (24 de-

grees Centigrade), and is applicable for a 5-year/50,000 mile useful life. (50,000 miles = 80,500 kilometers.)

*Categories of light trucks:* Starting in 1994, there are four categories of light trucks, LDT1 through LDT4, with LDT1 the lightest. Because of the constraints of space in Table 4-6a, only the standards for LDT2 have been presented. In 1996, LDT2s accounted for more than 60 percent of the sales of new light trucks. (See the *NTS-99* or the EPA's *Tier 2 Study White Paper*, or the *U.S. Code of Federal Regulations* for the LDT1, LDT3 and LDT4 standards.) During 1988-1993, light duty trucks were divided into two subcategories, which correspond to the current LDT1 and the LDT2// LDT3//LDT4 categories.

LDT1 and LDT2 are defined in regulations as having a Gross Vehicle Weight Rating (GVWR) of up to 6,000 pounds (2,722 kilograms). (GVWR is the value specified by the manufacturer as the maximum design loaded weight of the vehicle.) The LDT1 and LDT2 categories differ in their Loaded Vehicle Weights (LVW). (LVW is the vehicle curb weight plus 300 pounds (136 kilograms)). LDT1 has a LVW of 0 to 3,750 pounds (0 to 1,701 kilograms) and LDT2 has a LVW of 3,751 to 5,750 pounds (1,701 to 2,608 kilograms). LDT3 and LDT4 are defined in regulations as having a GVWR of 6,001 pounds to 8,500 pounds (2,722 kg to 3,856 kg). LDT3 and LDT4 are divided according to their Adjusted Loaded Vehicle Weight. For more detail, see the *EPA Tier 2 Study White Paper*. Trucks weighing 8,501 pounds (3,856 kilograms) and more are defined as Heavy Duty Trucks.

**SECTION 5: DOMESTIC FREIGHT ACTIVITY**

**Tables 5-1 and 5-2**  
**Domestic Freight Activity by Mode**  
**(Metric Tons)**

**Domestic Freight Activity by Mode**  
**(Metric Ton-Kilometers)**

**Canada**

Tables 5-1 and 5-2 are based on the following primary sources:

Air: Statistics Canada. *Canadian Civil Aviation, Catalogue 51-206-XPB*. (Ottawa, Ont.: various years).

Coastal shipping, Great Lakes and inland waterway and rail: Transport Canada. Economic Analysis Directorate based on Statistics Canada data. (Ottawa, Ont.: 1998).

Pipeline: Statistics Canada. *Oil Pipeline Transport, Catalogue 55-201-XPB*, and *Gas Utilities Transport and Distribution Systems, Catalogue 57-205-XPB*. (Ottawa, Ont.: various years).

Rail: Transport Canada. Economic Analysis Directorate based on Statistics Canada data. (Ottawa, Ont.: 1998)

Road: Statistics Canada. *Trucking in Canada, Catalogue 53-222-XPB*. (Ottawa, Ont.: various years).

Air: Air data reflect Level I to III Canadian air carriers that transported 1,000 or more metric tons of revenue goods, or 5,000 or more revenue passengers, between airports located within Canada. In Table 5-1, air data are in millions of metric tons. Actual tonnage is as follow: 1990: 386,749 metric tons; 1995: 416,171; and 1996: 447,313. In Table 5-2, data are in billions of metric ton-kilometers. Actual movements in thousands of

metric ton-kilometers are as follows: 1990: 532,396; 1995: 584,824; and 1996: 603,771.

Pipeline: Pipeline data include the amounts and metric ton-kilometers of oil and natural gas transported via domestic pipelines. These are calculated based upon determination of a percentage allocation between domestic and export deliveries. This split in volumes and distance is based on total volumes delivered, multiplied by the relative percentage of domestic deliveries. A conversion factor of 0.711 was used to convert cubic foot quantities of oil and natural gas moved by pipeline to metric ton equivalents.

Rail: Rail data are based on Class I and II rail loadings and unloadings. Class I includes Canadian National (CN) and Canadian Pacific (CPR) railways. Class II includes other railways involved in Canadian rail transportation operations. In Table 5-1 tonnage data exclude exports, imports and Class I carrier interline tonnage. In Table 5-2, the data for metric ton-kilometers similarly exclude exports, imports and Class I interline tonnage. (Freight interlined with Class II carriers was included while interline duplication between CN and CPR was removed).

Road: Road data are based on the *Quarterly For-Hire Trucking (Commodity Origin/Destination) Survey*. This survey measures outputs of the Canadian for-hire trucking industry by providing estimates of intercity commodity movements. Output variables include metric tons transported, commodities carried, revenues generated and origins and destinations of shipments. The target population consists of all shipments transported by Canadian domiciled for-hire motor carriers with annual transportation revenues derived from intercity trucking of \$1 million or more. Courier and messenger services are not covered by this survey.

*Water transport:* All water data are based on domestic shipping information that is collected by means of the *S.1 Domestic Shipping Report* and the *S.4 Towboat and Ferry Operators Shipping Report* (the *S.4 report* is used on the West Coast only). A record of activity is filed with Statistics Canada for each vessel entering or leaving a Canadian port in domestic shipping, with the exception of cargo vessels under 15 net registered tons, tugs or other vessels under 15 gross registered tons, Canadian naval or fishing vessels, research vessels, ballast movements for towboats and ferry operators on the West Coast.

### **Mexico**

Air: Secretaría de Comunicaciones y Transportes. Dirección General de Aeronáutica Civil. *La Aviación Mexicana en Cifras 1990-1996*. (Mexico City, D.F.: 1998).

Water transport: Secretaría de Comunicaciones y Transportes. Coordinación General de Puertos y Marina Mercante. *Los Puertos Mexicanos en Cifras 1990-1996*. (Mexico City, D.F.: 1997).

Rail: Secretaría de Comunicaciones y Transportes. Based on data from Ferrocarriles Nacionales de México. *Series estadísticas 1990, 1995 and 1996*. (Mexico City, D.F.: various years).

Road: Secretaría de Comunicaciones y Transportes. Dirección General de Autotransporte Federal. (Mexico City, D.F.: 1997).

*Air:* Data include shipments transported by domestic airlines under scheduled service and freight charters (shipments carried by air taxis are not included).

*Water transport:* Data include shipments made through the ports of the Pacific, the Gulf of Mexico and the Caribbean. In Table

5-2 an average distance of 630 kilometers for coastal sailing was assumed. Although this number is a 1988 estimate made by the former Dirección General de Obras Marítimas (Office of Maritime Works), the coastal sailing structure in Mexico has not changed much since then, so the figure remains a reasonable estimate.

*Rail:* Exports and imports are excluded from the rail data. Data represent the activity of all railroad systems. For Table 5-2 data were based on the average distances for the total system freight activity. For each year, the data were calculated using the following formula:

Ton-km transported in domestic traffic = (total ton-km transported/total ton transported) x ton transported in domestic traffic.

*Road:* Data are based on estimates of the number of freight vehicles registered to travel on the federal highway network in the *Sistema Integral de Información del Autotransporte Federal* (SIIAF) (Integral Information System of Federal Motor Carriers) of the Secretaría de Comunicaciones y Transportes, plus surveys that provide data on the actual average payload per vehicle per trip in tons and the number of trips per vehicle per week. Data for metric tons are calculated using the following formula:

Transported tons per year = Number of vehicles x average load per trip x average trips per vehicle per week x 52

These survey data are included in the document *Estadística Básica del Autotransporte Federal* (Basic Statistics of Federal Motor Carriers) prepared by Dirección General de Autotransporte Federal (Federal Motor Carrier General Directorate) of the Secretaría de Comunicaciones y Transportes.



For table 5-2, the estimate of metric tons is multiplied by the average distance that freight vehicles travel. The average distance is derived from a survey conducted by the Dirección General de Autotransporte Federal of the Secretaría de Comunicaciones y Transportes, and takes into consideration origin/destination information.

### United States

Table 5-1 is based on the following primary sources:

Air: U.S. Department of Transportation. Bureau of Transportation Statistics. Office of Airline Information. *Air Carrier Traffic Statistics*. (Washington, DC: various years). Page 2.

Coastal shipping, Great Lakes and inland waterways: U.S. Army Corps of Engineers. *Waterborne Commerce of the U.S., Part 5*. (New Orleans, LA: Annual issues). Section 1, Table 1-4.

Pipeline, crude oil and petroleum products: Association of Oil Pipe Lines. *Shifts in Petroleum Transportation*. (Washington, DC: various years). Table 1.

Pipeline, natural gas: U.S. Department of Transportation. Bureau of Transportation Statistics. Special tabulation based on Department of Energy data. (Washington, DC: 1999).

Rail: Association of American Railroads. *Railroad Facts, 1997*. (Washington, DC: 1997). Page 27.

Road: Eno Transportation Foundation, Inc. *Transportation in America, 1997*. (Lansdowne, VA: 1997). Page 44.

Table 5-2 is based on the following primary sources:

Air: U.S. Department of Transportation. Bureau of Transportation Statistics. Office of Airline Information. *Air Carrier Traffic Statistics*. (Washington, DC: various years). Page 2.

Coastal shipping, Great Lakes and inland waterways: U.S. Army Corps of Engineers. *Waterborne Commerce of the U.S., Part 5*. (New Orleans, LA: Annual issues). Section 1, Table 1-4.

Pipeline: Association of Oil Pipe Lines. *Shifts in Petroleum Transportation*. (Washington, DC: various years). Table 1.

Rail: Association of American Railroads. *Railroad Facts, 1997*. (Washington, DC: 1997). Page 27.

Road: Eno Transportation Foundation, Inc. *Transportation in America, 1997*. (Lansdowne, VA: 1997). Page 44.

Air: Air data are measured in enplaned revenue-tons and revenue ton-kilometers. These data include cargo, mail and express shipments. They include cargo being carried by the large certified domestic air carriers and some cargo airlines. Data for cargo carried by express carriers such as FedEx, DHL and UPS may be underrepresented. Air tonnage and ton-kilometers data represent the scheduled and nonscheduled activity of all large certified carriers. The large certificated air carriers operate aircraft with seating capacity of more than sixty seats or a maximum payload capacity of more than 8,165 kilograms (18,000 pounds.) (See technical notes under Table 4-2 for a more complete definition of the large certificated air carriers.) Data for commuter and foreign air carriers are not included. Data exclude military cargo moved by civilian carriers. Ton-kilometer data in Table 5-2 include U.S. and foreign mail and courier (express) services.

*Water transport (coastal shipping, Great Lakes, and inland waterways):* All water data are based on domestic waterborne traffic movements that are reported to the U.S. Army Corps of Engineers (USACE) by all vessel operators of record. Beginning in 1996, data on fishing are excluded for internal waterways traffic. Domestic ton-kilometers equal the cargo tonnage multiplied by the distance between the point of loading on the water and the point of unloading on the water. Specifically, for U.S.-Canada movements on the Great Lakes, ton-kilometers equal the tonnage multiplied by the distance between the U.S. and Canadian locations.

Great Lakes data include waterborne traffic between the United States ports on the Great Lakes system. The Great Lakes system is treated as a separate waterway system rather than as a part of the inland waterway system. Coastal shipping data include domestic traffic over the ocean, or the Gulf of Mexico (e.g., New Orleans to Baltimore, New York to Puerto Rico, San Francisco to Hawaii, or Alaska to Hawaii). Traffic between Great Lakes ports and seacoast ports, when having a carriage over the ocean, also is included in Coastal Shipping data. Inland waterways data represent the sum of the USACE categories of internal and intraport waterways. For USACE definitions of internal and intraport waterways, see the annual USACE publication, *Waterborne Commerce of the U.S. Part 5*.

*Pipeline:* Pipeline data in Table 5-1 are for domestic crude oil, petroleum products and natural gas shipments. Natural gas data in Table 5-1 are a BTS estimate based on Department of Energy data. Natural gas is typically measured in volumes using cubic feet, but has been converted to metric tons for purpose of this table. BTS converted the stan-

dard natural gas unit of measurement from cubic feet to metric tons, using a conversion factor of 1 metric ton to approximately 36,775 cubic feet. This conversion factor is based on assumptions about the relative composition of natural gas: proportions of methane, ethane, propane and other hydrocarbons.

Pipeline data for ton-kilometers in Table 5-2 include crude oil, petroleum products and natural gas shipments. Ton-miles for natural gas are estimates based on an approximate mile per ton rate for crude oil transported by pipelines. The crude petroleum and petroleum products data in both tables represent information from the Association of Oil Pipe Lines based on *Annual Report (Form 6)* data that oil pipeline companies submit to the Federal Energy Regulatory Commission. Note that the pipeline data for Table 5-2 will not correspond to pipeline data for ton-kilometers (ton-miles) in the annual BTS publication, *National Transportation Statistics*. This is because the *NTS* data for pipeline ton-miles only include crude oil and petroleum products.

*Rail:* Rail data are measured in revenue ton-kilometers and tons originated and is for Class I railroads only. In 1996 (Class I railroads had annual gross operating revenues in approximate excess of \$256 million and comprise only 2 percent of the railroads in the U.S., but account for 71 percent of the industry's distance operated, 89 percent of its employees and 91 percent of its freight revenues. Rail data reflect shipments that originated in the United States. The final destination of these shipments may or may not have been within the continental United States. The source of tonnage data in Table 5-1 are the freight commodity statistics re-

ports that Class I carriers are required by law to annually report to the Surface Transportation Board. The source of ton-kilometers in Table 5-2 are annual reports (R-1) that individual Class I carriers must also file with the Surface Transportation Board. The Association of American Railroads (AAR) then aggregates and releases a total figure for ton-kilometers by all Class I carriers on an annual basis.

*Road:* Road data represent an estimate of *intercity* trucking traffic *only*. The Eno Transportation Foundation (Eno) estimates truck tonnage based on truck tonnage trends reported by the American Trucking Association (ATA) and by truck vehicle-kilometers trends reported by the Federal Highway Administration at the U.S. Department of Transportation. Eno estimates truck ton-kilometers based on both actual changes in truck ton-kilometers as reported by the former Interstate Commerce Commission (ICC) and as based on changes in vehicle-kilometers of combination and large single-unit trucks on U.S. nonurban highways as reported annually by FHWA. To estimate truck ton-kilometers, Eno multiples vehicle-kilometers by an estimated average load figure.

**Table 5-3a**  
**Top Canadian Domestic Freight**  
**Commodities by Mode: 1996**

**Canada**

Table 5-3a is based on the following primary sources:

Pipeline, crude oil and petroleum products: Statistics Canada. *Oil Pipeline Transport, Catalogue 55-201-XPB, 1996.* (Ottawa, Ont.: 1997).

Pipeline, natural gas: Statistics Canada. *Gas Utilities, Transport and Distribution Systems,*

*Catalogue 57-205-XPB, 1996.* (Ottawa, Ont.: 1997).

Rail: Statistics Canada. *Rail in Canada, Catalogue 52-216-XPB, 1996.* (Ottawa, Ont.:1998).

Road: Statistics Canada. Transportation Division. Special "For-Hire" Trucking tabulations for Transport Canada. (Ottawa, Ont.: 1998).

Water transport: Transport Canada. Economic Analysis Directorate. (Ottawa, Ont.: 1998). (Tabulations derived from Statistics Canada's Marine Database.)

Pipeline data include amounts of oil, natural gas and petroleum products transported via domestic pipelines and is calculated based upon determination of a percentage allocation between domestic and export deliveries. This split in volumes is based on total volumes delivered, multiplied by the relative percentage of domestic deliveries. A conversion factor of .711 was used to convert cubic foot quantities of oil and natural gas products moved by pipeline to metric ton equivalents. Rail data in this table are based on Canadian Class I and II carriers.

**Table 5-3b**  
**Top Mexican Domestic Freight**  
**Commodities by Mode: 1996**

**Mexico**

Rail: Secretaría de Comunicaciones y Transportes based on data from the Ferrocarriles Nacionales de México. *Series Estadísticas, 1996.* (Mexico City, D.F.: 1997).

Road: Instituto Mexicano del Transporte based on the vehicle's weight and dimensions study. (Sanfandila, Qro.: 1997).

Water: Secretaría de Comunicaciones y Transportes. Coordinación General de Puertos y Marina Mercante. (Mexico City, D.F.: 1997).

*Rail and water transport:* The principal transported goods are listed as individual products, not as major groupings of products. Data come from railroad bills of lading and maritime cargo manifests.

*Road:* Groups of similar products are listed. The numbers are derived from a sample using field measurements and surveys on the federal highways for the year 1993. For 24 hours during 3 consecutive days, survey and weighing stations were set up at strategic locations on the federal highway network, which covers the main routes of the country. The numbers include, but do not identify, commodities traded internationally. The data are included here because they represent the main commodities transported by road within the country.

**Table 5-3c**  
**Top U.S. Domestic Freight**  
**Commodities by Mode: 1993**

**United States**

Air, road and rail: U.S. Department of Commerce. U.S. Census Bureau. *1993 Commodity Flow Survey*. Special tabulation. (Washington, DC: 1998).

Pipeline: U.S. Department of Transportation. Bureau of Transportation Statistics. Special tabulation. (Washington, DC: 1998).

Water: U.S. Army Corps of Engineers (USACE). *Waterborne Commerce of the United States, Calendar Year 1996; Part 5—National Summaries*. (New Orleans, LA: 1997).

*Air, rail, road and intermodal data:* Data for these modes are from the 1993 Commodity

Flow Survey (CFS) and are based on the Standard Transportation Commodity Classification (STCC) code. The CFS collects information on the commodities shipped by domestic U.S. manufacturing, mining, wholesale trade and selected retail and service industries. The survey excludes shipments by most service industries, governments, households and establishments classified as farms and construction. The CFS includes exports but not imports. Air data in table 5-3c represent shipments by both air and truck/air combination. Rail data represent rail single mode shipments. Road data represent shipments moved by private truck and for-hire truck. Intermodal data represent shipments moved by intermodal truck and rail combination.

*Pipeline:* Crude oil and petroleum products data are estimates from the Oak Ridge National Laboratory (ORNL), based on information from the Federal Energy Regulatory Commission. Natural gas data are BTS estimates based on information on natural gas delivered to consumers from the U.S. Department of Energy's *Natural Gas Annual*. BTS converted the standard natural gas unit of measurement from cubic feet to metric tons, using a conversion factor of 1 metric ton to approximately 36,775 cubic feet. This conversion factor is based on assumptions about the relative composition of natural gas: proportions of methane, ethane, propane and other hydrocarbons. In 1993, pipelines transported about 18.5 trillion cubic feet.

*Water transport:* Water data are from the U.S. Army Corps of Engineers' (USACE) publication, *Waterborne Commerce of United States* and are based on USACE waterborne commodity codes.

**Table 5-4a**  
**Top Canadian Domestic Freight**  
**Interprovincial Pairs by Mode: 1996**

**Canada**

Table 5-4a is based on the following primary sources:

Rail: Transport Canada. Economic Analysis Directorate. (Ottawa, Ont: 1998). (Rail data adapted by Transport Canada from Statistics Canada Sources.)

Road: Statistics Canada. Transportation Division. Special “For-Hire” Trucking tabulations for Transport Canada. (Ottawa, Ont.: 1998).

Water transport: Transport Canada. Economic Analysis Directorate. (Ottawa, Ont.: 1998). (Tabulations derived from Statistics Canada’s Marine Database.)

Rail data in this table are based on Canadian Class I and Class II carriers. Class I includes Canadian National (CN) and Canadian Pacific (CPR) railways. Class II includes other railways involved in Canadian rail transportation operations.

**Table 5-4b**  
**Top U.S. Domestic Freight Interstate**  
**Pairs by Mode: 1993**

**United States**

U.S. Department of Commerce. U.S. Census Bureau. *1993 Commodity Flow Survey*. Special tabulation. (Washington, DC: 1998). CD-CFS-93-2.

All modal data presented in this table are from the 1993 *Commodity Flow Survey (CFS)*, which collects information on the commodities shipped by domestic U.S. manufacturing, mining, wholesale trade and selected retail

and service industries. The survey excludes shipments by most service industries, governments, households and establishments classified as farms and construction. The CFS includes exports but not imports.

Air data represent shipments by both air and truck/air combination. Pipeline data are non-existent because the CFS data do not fully represent crude petroleum shipments by pipelines and there is no origin and destination information for pipeline shipments. Rail data represent rail single mode shipments. Road data represent shipments moved by private truck and for-hire truck. Water data include freight movements on inland, Great Lakes and deep-sea waterways. Intermodal data represent shipments moved by intermodal truck and rail combination.

**Table 5-5a**  
**Top Canadian Domestic Freight Area**  
**Pairs by Mode: 1996**

**Canada**

Table 5-5a is based on the following primary sources:

Road: Statistics Canada. Transportation Division. Special “For-Hire” Trucking tabulations for Transport Canada. (Ottawa, Ont.: 1998).

Water transport: Transport Canada. Economic Analysis Directorate. (Ottawa, Ont.: 1998). (Tabulations derived from Statistics Canada’s Marine Database.)

For road and water transport data, see technical notes for Tables 5-1 and 5-2.

**Table 5-5b**  
**Top Mexican Domestic Freight Area**  
**Pairs by Mode: 1996**

**Mexico**

Air: Instituto Mexicano del Transporte based on special tabulation of the Secretaría de Comunicaciones y Transportes. (Sanfandila, Qro: 1999). Dirección General de Aeronáutica Civil.

Rail: Instituto Mexicano del Transporte. *Evaluación Económica de Mejoras a la Infraestructura del Sistema Nacional Ferroviario, Publicación Técnica No. 82*. Estimates included in this document based on information from the Ferrocarriles Nacionales de México. (Sanfandila, Qro.: 1996).

Road: Instituto Mexicano del Transporte. Special tabulation from *Estudio de pesos y dimensiones de los vehículos de carga que circulan en la red nacional de carreteras, 1994*. (Sanfandila, Qro.: 1999.)

Water transport: Secretaría de Comunicaciones y Transportes. Coordinación General de Puertos y Marina Mercante. (Mexico City, D.F.: 1997).

Rail: The original data source document is the *Informe de Tráfico de Flete Comercial por Artículos Clasificados por Estaciones Remitentes y Receptoras (Report on Commercial Fleet Traffic per Classified Items sent to Receiving Stations)*, previously collected by the Ferrocarriles Nacionales de México. Data include all rail movements within Mexico, and may include some cargo with foreign destinations. Data shown are major interurban movements. The two highest rail freight pairs were excluded, because they owe their ranking to the transportation of raw materials for the production process of particular firms: (1) the transportation of 2,237,000 tons

of limestone between Huehuetoca and Tlalnepantla, both in the State of Mexico; and (2) 1,784,000 tons of coal between Nueva Rosita and Monclova, Coahuila.

Road: Figures come from field surveys on the federal highways for the year 1993. For 24 hours during 3 consecutive days, survey and weighing stations were set up at strategic locations on the federal highway network, which cover the main routes of the country. Figures include, but do not identify, commodities traded abroad. The data are included here because they represent the main origin/destination pairs for road transportation of goods within the country.

**SECTION 6: NORTH AMERICAN**  
**MERCHANDISE TRADE**

**Table 6-1a**  
**Canadian Merchandise Trade With**  
**Mexico and the United States by Mode**  
**of Transportation**

(Current U.S. dollars)

**Canada**

Statistics Canada. International Trade Division. Special tabulations. (Ottawa, Ont.: 1998).

*Merchandise trade, data collection and sources*: The primary objective of the Canadian International Merchandise Trade Statistical Program is to measure the change in the stock of material resources of the country resulting from the movement of merchandise into or out of Canada. When goods are imported into or exported from Canada, declarations must be filed with Canadian Customs giving such information as description and value of the goods, origin and port of clearance of commodities and the mode of transport. In 1990, Canada entered into a Memorandum of Understanding (MOU) with the United States

concerning the exchange of import data. As a consequence, each country is using the other's import data to replace its own export data. Canada's international merchandise trade statistics are, therefore, no longer derived exclusively from the administrative records of Revenue Canada, Customs and Excise, but from U.S. Customs records as well.

*Merchandise trade, definitions:* Canadian merchandise trade statistics are compiled according to the "General" system of trade defined by the United Nations Statistical Office. Under this system, imports include all goods that have crossed Canada's territorial boundary, whether for immediate consumption in Canada or stored in bonded Custom warehouses. Domestic exports include goods grown, extracted or manufactured in Canada, including goods of foreign origin that have been materially transformed in Canada, including foreign goods withdrawn for export from bonded customs warehouses. Total exports are the sum of domestic exports and reexports. Thus the general trade system, in principal, presents all goods entering through the country (imports) and all goods leaving the country (exports).

*Valuation of imports:* For Customs purposes, imports are recorded at values established according to the provisions of Canada's *Customs Act*, which, since January 1985, reflect valuation methods based on the General Agreement on Tariffs and Trade (GATT) Valuation Code System. It generally requires the value for duty of imported goods be equivalent to the transaction value or the price actually paid. To determine the transaction value of imported goods, all transportation and associated costs arising prior to and at the place of direct shipment to Canada are to be added to the price of the goods. Therefore, Canadian imports are valued f.o.b. (free

on board), place of direct shipment to Canada. This valuation excludes the freight and insurance costs in bringing the goods into Canada from the point of direct shipment.

*Valuation of exports:* To countries other than the United States, exports are, in principal, valued or recorded at the values declared on export documents, which usually reflect the transaction value; i.e., the actual selling price, or for specific transactions, the transfer price used for company accounting purposes. Canadian exports to overseas countries are valued at f.o.b. (free on board), port of exit, including domestic freight charges to the port of exit, but net of discounts and allowances. As of January 1990, Canadian exports to the United States are valued f.o.b., point of exit from Canada.

*Method of transportation:* For exports, the mode of transport information represents the mode of transport by which the international boundary is crossed. For Canadian exports via the United States to Mexico, the mode reported would be the mode used to cross the Canadian/U.S. border. If, for example, Canadian export shipments destined for Mexico travel by truck through Fort Erie, Ontario, then the mode reported in this table, and in Canadian international trade data, will be truck.

For imports, the mode of transport information represents the last mode of transport by which the cargo was transported to the port of clearance in Canada and is derived from the cargo control documents of Canadian Customs. This may not be the mode of transport by which the cargo arrived at the Canadian port of entry in the case of inland clearance. If, for example, Canadian import shipments from Mexico crossed the Canadian/U.S. border by rail, but are not cleared by Canadian Customs until they reach an-

other city by truck, the mode reported, in Canada's international trade statistics, will be truck.

In this and similar tables and for both import and export shipments, the category of *pipeline and other* are, for the most part, pipeline movements. *Other* represents mail and parcel post and other miscellaneous modes of transport.

**Table 6-1b**  
**Mexican Merchandise Trade With Canada and the United States by Mode of Transportation**

(Current U.S. dollars)

**Mexico**

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Estadística. Dirección de Estadísticas Económicas. Based on data developed through an interagency working group including the Secretaría de Hacienda y Crédito Público, Banco de México and Instituto Nacional de Estadística, Geografía e Informática. (Mexico City, D.F.: 1999).

*Total trade:* Total export and import figures are final. Figures on exports and imports by mode of transportation are preliminary. Totals differ from the sum of the modes because data for "Postal and other" modes were not included in the modal subcategories, but were included in the overall totals.

*Maquiladora trade:* The Maquiladora industry accounted for 39.1 percent and 38.5 percent of the total value of exports for 1995 and 1996, respectively, and 35.2 percent and 33.2 percent of imports for those 2 years.

**Table 6-1c**

**U.S. Merchandise Trade With Canada and Mexico by Mode of Transportation**

(Current U.S. dollars)

**United States**

*Total trade:* U.S. Department of Commerce. Census Bureau. *Statistical Abstract of the United States*. (Washington, DC: 1990, 1995 and 1996).

*Air and water:* U.S. Department of Commerce. Census Bureau. Foreign Trade Division. *FT920 Report, U.S. Merchandise Trade: Selected Highlights* (Washington, DC: December 1990, 1995 and 1996).

*Road, rail and pipeline:* U.S. Department of Transportation. Bureau of Transportation Statistics. *Transborder Surface Freight Data*. (Washington, DC: 1998).

For a detailed documentation on U.S. international trade data, see the U.S. Census Bureau's *Guide to Foreign Trade Statistics* (available at <http://www.census.gov/foreign-trade/www/ftd.stat.guide.html>).

*Merchandise trade, data collection and sources:* Data on the value of U.S. air, maritime and land imports and exports are captured from administrative documents required by the Departments of Commerce and Treasury. In 1990, the United States entered into a Memorandum of Understanding (MOU) with Canada concerning the exchange of import data. As a consequence, each country is using the other's import data to replace its own export data. The United States' international merchandise trade statistics are, therefore, no longer derived exclusively from the administrative records of the Departments of Commerce and Treasury, but from Revenue Canada, Customs and Excise as well. Historically, merchandise trade data were obtained from import and export paper documents that



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the U.S. Customs Service collected at a port of entry or exit. However, an increasing amount of import and export statistical information is now being captured electronically. Approximately 98 percent of U.S. import and 60 percent of U.S. export data are collected electronically.

*Merchandise trade, definitions:* Data represent merchandise trade activity between the United States, Puerto Rico and the U.S. Virgin Islands and Canada and Mexico. These statistics do not include traffic between Guam, Wake Island and American Samoa and Canada and Mexico.

*Valuation of imports and exports:* Import values represent the value of merchandise for duty (or Customs) purposes. It is usually the selling price in the foreign country of origin, and excludes freight costs, insurance and other charges incurred in bringing the merchandise from the foreign port of export to the United States. For exports to all countries except Canada, export values represent the value of the merchandise, usually the selling price, plus insurance, inland freight costs and other charges incurred in bringing the merchandise to the U. S. port of export. This is generally called the f.a.s. (free alongside ship) value. These export values *exclude* the cost of loading the merchandise aboard the exporting carrier at the port of export and also exclude freight, insurance, and any charges or transportation costs beyond the U.S. port of exportation. Because the United States does not collect information for U.S. exports to Canada from its own trade documents, the value of these exports represents the transaction value of the merchandise, plus a Statistics Canada *imputed* estimate of the costs of insurance, inland freight and other charges. Statistics Canada estimate is based on 4.5 percent of the export merchandise transaction value.

*Method of Transportation:* Method of transportation is based on the method of transportation in use when the merchandise arrived at the U.S. Customs port of entry or departed a U.S. Customs port of exit. In some instances, shipments between the United States and countries abroad enter or depart the United States through Canada or Mexico. These are called transshipments. Such transshipments are recorded under the method of transportation by which they enter or depart a U.S. Customs port regardless of the transportation mode used between Canada or Mexico and the final country of origin or destination. For U.S. exports via Canada to other overseas countries, the mode reported would be the mode used to cross the U.S./Canadian border. If, for example, export shipments that are destined for the United Kingdom travel by truck through Buffalo/Niagara, NY, and are then shipped by water from a Canadian port to the United Kingdom, the mode reported in U.S. international trade data would be truck.

For the time period April 1993 through December 1996, transshipments were included in official U.S. trade data for land modes of transportation, and it is impossible to exclude these transshipments *at an individual modal level*. Because the land modes include transshipment data, the sum of the modal categories exceeds total U.S. trade with Canada and Mexico for 1995 and 1996. Moreover, it is not possible to calculate modal percentage shares for 1995 and 1996. Beginning in January 1997, transshipments are no longer included in the U.S. trade figures for land modes of transportation. Thus, the modal shares for 1997 can be calculated. The 1997 modal shares for total U.S. merchandise trade with Canada and Mexico are: air (5.8 percent); water (4.6 percent); road (68.0 percent); rail (14.7 percent); pipeline (3 percent); and other (3.9 percent).

## U.S. Trade With Canada and Mexico by Land Modes of Transportation\*

(Millions of current U.S. dollars)

	1995, total with transshipments	1995, total without transshipments	1996, total with transshipments	1996, total without transshipments
<b>U.S. trade with Canada</b>				
Exports to Canada	129,884.1	108,311.1	139,109.7	117,341.8
Imports from Canada	143,669.5	135,212.2	156,206.6	146,374.3
<b>U.S. trade with Mexico</b>				
Exports to Mexico	42,662.2	42,294.5	51,753.4	51,252.7
Imports from Mexico	54,048.9	51,489.7	63,312.2	62,188.1

\*Land modes of transportation include truck, rail, pipeline, government mail, flyaway aircraft (aircraft moving from the aircraft manufacturer to a customer and not carrying any freight), powerhouse electricity, pedestrians carrying freight, foreign trade zones (for imports only) miscellaneous and unknown.

**Source:** U.S. Department of Transportation, Bureau of Transportation Statistics. *Transborder Surface Freight Data* ([www.bts.gov/transborder](http://www.bts.gov/transborder))

In contrast to transshipments, *intransit shipments* are goods declared by the shipper as moving through the United States from one foreign country to another and are *not* included in the official U.S. international merchandise trade statistics, and therefore are not included in this data for this table. In a North American context, intransit shipments would include, for example, a Canadian export to Mexico, which moves by truck through the United States. This type of activity, again, is not considered to be part of U.S. international trade, and is not reflected in official U.S. merchandise trade statistics, or in the data in this table.

The following modes are included in U.S. merchandise trade statistics: air, maritime vessel, truck, rail, pipeline, government mail, flyaway aircraft (aircraft moving from the aircraft manufacturer to a customer and not carrying any freight), powerhouse electricity, pedestrians carrying freight, foreign trade zones (for imports only) miscellaneous and unknown. Data for land modes (i.e., truck, rail, pipeline, mail and other) of transportation are nonexistent prior to April 1993. Government mail, flyaway aircraft, powerhouse electricity, pedestrians carrying freight, foreign trade zones, miscellaneous and unknown methods of transportation have not

been included as specific categories for U.S. merchandise trade in Sections 6 and 7 of this publication. However, these modes of transportation are included in the overall U.S. merchandise trade figures.

**Table 6-2a**  
**Canadian Merchandise Trade With**  
**Mexico and the United States by Mode**  
**of Transportation**

(Metric tons)

**Canada**

Statistics Canada. International Trade Division. Special tabulations. (Ottawa, Ont.: 1998).

*Merchandise trade, weight data:* The International Trade Division (ITD) of Statistics Canada publishes monthly trade statistics for both exports and imports. The data are drawn from Revenue Canada (Customs) administrative files that are used for applying import/export and tariff regulations. A variety of trade characteristics are reported monthly for each commodity, with the main ones being country, commodity, mode of transport and value. The capture and reporting of weight information by commodity is generally given less priority than value and country data. Weight and quantity information currently reported by ITD depend, for the most part, on what commodity is being reported. For instance, most bulk commodities e.g., wheat, coal, potash, are reported in metric tons. Commodities of a more finished nature tend to be reported in various units of quantity or weight, generally using one of the international units of measure published in the Statistics Canada report, *Imports by Commodity* (65-007-XPB).

*Merchandise trade, weight data collection:* With the current system used by Revenue Canada

Customs to report international trade data; i.e., using the *B3* reporting form (for imports) and the *B13* reporting form (for exports to overseas countries), there is no requirement for custom brokers to report in one consistent unit of weight measurement. Except for exports to the United States, Canadian exporters and importers are not required to report a shipping weight for each commodity shipped. The requirement is to report an overall gross and net weight for each record, which may include one or multiple commodities on any one form. Value and mode of transport are always captured for each commodity and quantity is frequently captured. Trade data by mode of transport are published in value terms only.

*Weight conversion methodology and factors:* Canada and the United States capture and exchange import trade data as part of a bilateral data exchange agreement. On a monthly basis, Canada sends to the United States data on its imports from the United States and, in turn, receives from the United States data covering imports from Canada. As both countries record imports using different trade documents, with different requirements, the data elements collected are not consistent in all areas. For instance, the United States collects weight data for each import commodity by all modes of transportation for merchandise trade with all countries. If relevant to the commodity type, the United States also collects quantity information on all merchandise imports. However, the weight and quantity information captured by Revenue Canada depends on the type of commodity.

A variety of validation and edit checks are performed on the U.S. imports from Canada, before the data are sent back to Canada as part of the U.S.-Canada data exchange. From

this edited file, relationships can be derived between quantities, value and shipping weight for each commodity. Statistics Canada has used these relationships in the development of a weight conversion methodology and factors. Use of the Harmonized System (HS) for commodity classification has been an important component in the development of these conversions. At the six-digit HS level, exports and imports are essentially the same, and likely possess similar weight characteristics. Statistics Canada conversion methodology involves the development of factors for converting the value or quantity of international trade commodities to metric tons for six-digit HS codes. Trade commodities reported in nonmetric units for imports from all countries (including the U.S.) as well as exports to all countries (excluding the U.S.) are converted using one of the following conversion factors: quantity to shipping weight (quantity conversion factor); or value to shipping weight (value conversion factor). If quantity information is available, the quantity conversion factor is used. If not, the value conversion factor is used. Because exports to the United States already provided shipping weight information and served as the source of Statistics Canada's conversion factors, they are accepted as is.

*Method of transportation:* For exports, the mode of transport information represents the mode of transport by which the international boundary is crossed. For Canadian exports via the United States to Mexico, the mode reported would be the mode used to cross the Canadian/U.S. border. If, for example, Canadian export shipments destined for Mexico travel by truck through Fort Erie, Ontario, then the mode reported in this table, and in Canadian international trade data, will be truck.

For imports, the mode of transport information represents the last mode of transport by which the cargo was transported to the port of clearance in Canada and is derived from the cargo control documents of Canadian Customs. This may not be the mode of transport by which the cargo arrived at the Canadian port of entry in the case of inland clearance. If, for example, Canadian import shipments from Mexico crossed the Canadian/U.S. border by rail, but are not cleared by Canadian Customs until they reach another city by truck, the mode reported, in Canada's international trade statistics, will be truck.

In this and similar tables and for both import and export shipments, the category of *pipeline and other* are, for the most part, pipeline movements. *Other* represents mail and parcel post and other miscellaneous modes of transport.

**Table 6-2b**  
**Mexican Merchandise Trade With**  
**Canada and the United States by Mode**  
**of Transportation**

(Metric tons)

#### **Mexico**

Air: Secretaría de Comunicaciones y Transportes. Dirección General de Aeronáutica Civil. Special tabulation. (Mexico City, D.F.: 1997).

Water transport: Secretaría de Comunicaciones y Transportes. Coordinación General de Puertos y Marina Mercante. (Mexico City, D.F.: 1998).

Road and rail, 1996: Instituto Mexicano del Transporte. Special tabulations based on data from the Secretaría de Comercio y

Fomento Industrial and U.S. Bureau of Transportation Statistics. (Querétaro, Qro.: 1998). See also Juan Manuel Trejo. *Una metodología para valuar los beneficios económicos de mejoras en los sistemas de transporte* (A Methodology to Evaluate the Economic Benefits of Improving the Transportation Systems), M.S. Thesis, Querétaro Autonomous University, Qro.

*Road and rail, 1996:* The Instituto Mexicano del Transporte (IMT) estimated the figures based on data provided by the Secretaría de Comercio y Fomento Industrial in Mexico and the Bureau of Transportation Statistics in the United States. For 1995, the IMT estimates that 4,023 million tons were exported from Mexico to the north, and 11,005 million tons were imported into Mexico from the north. The United States was the origin and destination of the vast majority of these shipments, although some shipments originated in, or were destined for, Canada. There is no way of quantifying the specific proportion allocated to Canada versus the United States.

For 1996, 5,482 million tons were exported from Mexico to the north by rail. Of this, 4,813 million tons were shipped to the United States. The remaining 669 million tons were either shipped to Canada or (although originating in Mexico as rail shipments) were ultimately transshipped via air or sea through U.S. or Canadian ports. Also in 1996, 12,933 million tons were imported into Mexico from the north by rail. Of this, 10,307 million tons came from the United States. The remaining 2,626 million tons came either from Canada or from a third country, but reached Mexico as a transshipment from Canadian or U.S. ports.

## Table 6-2c

### U.S. Merchandise Trade With Canada and Mexico by Mode of Transportation

(Metric tons)

#### United States

Total trade: U.S. Department of Commerce. U.S. Census Bureau. *Statistical Abstract of the United States*. (Washington, DC: 1990, 1995 and 1996).

Air and water: U.S. Department of Commerce. U.S. Census Bureau. Foreign Trade Division. *FT920 U.S. Merchandise Trade*. (Washington, DC: December 1990, 1995 and 1996).

Road, rail and pipeline: U.S. Department of Transportation. Bureau of Transportation Statistics. *Transborder Surface Freight Data*. (Washington, DC: 1998).

*Shipping weight:* Shipping weight represents the gross weight in kilograms of shipments, including the weight of commodities and packaging (such as wrappings, crates, boxes and containers). For air, maritime vessel and imports by land modes of transportation, shipping weight information is a required data element on the merchandise trade documents of the Departments of Commerce and Treasury. Currently, data on the shipping weight of exports by land modes of transportation (truck, rail, pipeline, mail and other) are not required to be collected if the exporter or broker files a paper trade documentation, known as the *Shipper's Export Declaration*. (At present, approximately 30-40 percent of U.S. export data are collected via paper trade documents). Under new automated filing procedures through the Automated Export System (AES), shipping weight for exports will be required. In addition, because shipping weight for imports from Mexico by land modes of transportation only

became available in April 1995, calendar year 1995 data are not available for inclusion in Table 6-2c. For additional explanation, see notes for Table 6-1c.

*Method of transportation:* Method of transportation is based on the method of transportation in use when the merchandise arrived at the U.S. Customs port of entry or departed a U.S. Customs port of exit. In some instances, shipments between the United States and countries abroad enter or depart the United States through Canada or Mexico. These are called transshipments. Such transshipments are recorded under the method of transportation by which they enter or depart a U.S. Customs port regardless of the transportation mode used between Canada or Mexico and the final country of origin or destination. For U.S. exports via Canada to other overseas countries, the mode reported would be the mode used to cross the U.S./Canadian border. If, for example, export shipments that are destined for the United Kingdom travel by truck through Buffalo/Niagara, NY, and are then shipped by water from a Canadian port to the United Kingdom, the mode reported in U.S. international trade data would be truck.

For the time period April 1993 through December 1996, transshipments were included in official U.S. trade data for land modes of transportation, and it is impossible to exclude these transshipments, measured in weight, at either a total land trade or individual modal level. Because of this inclusion of transshipment data for the land modes of transportation, a summation of the individual modal categories will exceed the U.S. total trade with Canada and Mexico for 1995 and 1996. Beginning in January 1997, transshipments are no longer included in the U.S. trade figures for land modes of transportation.

In contrast to transshipments, *intransit shipments* are goods declared by the shipper as moving through the United States from one foreign country to another and are *not* included in the official United States international merchandise trade statistics, and therefore are not included in this data for this table. In a North American context, intransit shipments would include, for example, a Canadian export to Mexico, which moves by truck through the United States. This type of activity, again, is not considered to be part of U.S. international trade, and is not reflected in official U.S. merchandise trade statistics, or in the data in this table.

**Table 6-3a**  
**Top Canadian Gateways for North American Merchandise Trade by Mode: 1996**

(Current U.S. dollars)

**Canada**

Statistics Canada. International Trade Division. Special tabulations. (Ottawa, Ont.: 1998). See notes for Table 6-1a.

**Table 6-3b**  
**Top Mexican Gateways for North American Merchandise Trade by Mode: 1996**

(Current U.S. dollars)

**Mexico**

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Estadística. Dirección de Estadísticas Económicas. Based on data developed through an interagency working group including the Secretaría de Hacienda y Crédito Público, Banco de México and Instituto Nacional de Estadística, Geografía e Informática. (Mexico City, D.F.: 1999).

This table shows the information by mode registered at the principal custom ports (or custom “houses”) in Mexico. Land transportation includes shipments by both road and rail. In addition, data from inland customs ports (and those not considered “principal”) are added to the overall figures for the principal customs ports shown in Table 6-3b.

**Table 6-3c**  
**Top U.S. Gateways for North American Merchandise Trade by Mode: 1996**  
 (Current U.S. dollars)

**United States**

Air: U.S. Department of Commerce. U.S. Census Bureau. Foreign Trade Division. Transportation Branch. Special tabulation. (Washington, DC: 1998).

Water: U.S. Department of Transportation. Maritime Administration. Office of Statistical and Economic Analysis. *Annual Waterborne Databanks 1996* (formerly TA 305/705). (Washington, DC: 1998).

Road, rail and pipeline: U.S. Department of Transportation. Bureau of Transportation Statistics. *Transborder Surface Freight Data*. (Washington, DC: 1998).

For additional explanation, see notes for Table 6-1c.

Air data for specific airports may include a low (generally less than 2-3 percent of the total value) level of small user-fee airports located in the same regional area. In addition, data for nearby individual courier operations are included in the certain airport totals to prevent disclosure. Land port totals include transshipment data. Port totals reflect the mode of transportation in use at the time the shipment entered or exited a U.S. Customs port.

**Table 6-4a**  
**Top Mexican Maritime Intransit Shipment Ports: January-June 1997**

**Mexico**

Instituto Mexicano del Transporte. Special tabulation based on 1997 data from the Journal of Commerce. *Port Import Export Reporting Service (PIERS)*. (Querétaro, Qro.: 1998).

**Table 6-4b**  
**Top U.S. Maritime Intransit Shipment Ports: 1996**

**United States**

U.S. Department of Transportation. Maritime Administration. Office of Statistical and Economic Analysis. *Annual Waterborne Databanks 1996* (formerly TA 305/705). (Washington, DC: 1998).

Intransit shipments are goods declared by the shipper as moving through the United States from one foreign country to another and are *not* included in the official U.S. international merchandise trade statistics or in the United States balance of trade of goods and services. Although U.S. international merchandise trade statistics cover all methods of transportation, the intransit statistics cover only goods, which enter or leave the United States by maritime vessel. Goods may arrive by vessel and depart by air, land or vessel, or arrive by land or air and depart by maritime vessel. Therefore, inbound and outbound intransit statistics may not cover the same intransit movements and these movements of goods do not present a full picture of the intransit trade. (For example, an intransit shipment that entered the United States by truck and exited by rail would not be included in these statistics at all.) In addition, the value data for intransit statistics

are estimated based on the type of commodity and its' shipping weight. Intransit data tend to be dutiable commodities since the United States Customs Service requires that shipments transiting through the United States be handled under a Customs bond (in-bond).

**Table 6-5a**

**Top Land Freight Crossing Ports,  
Canadian-U.S. Border: 1996**

**North and southbound:**

Data for trucks represent the number of truck crossings, not the number of unique vehicles. (For example, one truck may cross back and forth across the border several times in a day.)

Northbound (Canadian data source): Statistics Canada. Culture, Tourism and the Center for Education Statistics Division. Special tabulations. (Ottawa, Ont.: 1998).

Table 6-5a is based on data collected through Statistics Canada's Frontier Count program. All ports of entry across Canada participate in determining the number of cars, trucks, motorcycles and bicycles in the case of highway and ferry points as well as the number of travelers by selected categories and by type of transportation. These surveys are conducted on a census basis except for seven ports of entry that are using sampling schemes to estimate automobiles and motorcycle flows. The sample is intended to estimate U.S. and Canadian vehicles and travelers by country of residence. The samples are selected among the seven ports in order to represent all days of the month over the region. Customs officials at these ports provide the count of automobiles and cycle traffic by country of residence for those sample days. These counts are then weighted to the total flows provided by toll authorities.

Southbound (U.S. data source): U.S. Department of Treasury. U.S. Customs Service. Office of Field Operations. *Operations Management Database*. Special tabulation. (Washington, DC: 1998).

Data reflect all trucks and trains that entered the United States, across the U.S.-Canadian border, regardless of carrier nationality.

**Table 6-5b**

**Top Land Freight Crossing Ports,  
Mexican-U.S. Border: 1996**

**North and southbound:**

Data for trucks represent the number of truck crossings, not the number of unique vehicles. (For example, one truck may cross back and forth across the border several times in a day.)

Northbound (U.S. Data Source): U.S. Department of Treasury. U.S. Customs Service. Office of Field Operations. *Operations Management Database*. Special tabulation. (Washington, DC: 1998).

Data reflect all trucks and rail cars that entered the United States, across the U.S.-Mexican border, regardless of carrier nationality.

Southbound:

Trucks: Data compiled by Texas A&M International University, Texas Center for Border Economic and Enterprise Development based on original data from bridge operators. Web site: [www.tamui.edu/coba/txcntr/](http://www.tamui.edu/coba/txcntr/)

Rail: Instituto Mexicano del Transporte. *Manual Estadístico del Sector Transporte 1996*. (Querétaro, Qro.: 1998).



**Table 6-6a**  
**Top Canadian Merchandise Trade**  
**Commodities by Mode With Mexico:**  
**1996**

**Canada**

Statistics Canada. International Trade Division. Special tabulations. (Ottawa, Ont.: 1998).

See notes for Table 6-1a.

**Table 6-6b**  
**Top Canadian Merchandise Trade**  
**Commodities by Mode With the United**  
**States: 1996**

**Canada**

Statistics Canada. International Trade Division. Special tabulations. (Ottawa, Ont.: 1998).

See notes for Table 6-1a.

**Table 6-7a**  
**Top Mexican Merchandise Trade**  
**Commodities by Mode With Canada:**  
**1996**

**Mexico**

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Estadística. Dirección de Estadísticas Económicas. Based on data developed through an interagency working group including the Secretaría de Hacienda y Crédito Público, Banco de México and Instituto Nacional de Estadística, Geografía e Informática. (Mexico City, D.F.: 1999).

**Table 6-7b**  
**Top Mexican Merchandise Trade**  
**Commodities by Mode With the United**  
**States: 1996**

**Mexico**

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Estadística.

Dirección de Estadísticas Económicas. Based on data developed through an interagency working group including the Secretaría de Hacienda y Crédito Público, Banco de México and Instituto Nacional de Estadística, Geografía e Informática. (Mexico City, D.F.: 1999).

**Table 6-8a**  
**Top U.S. Merchandise Trade**  
**Commodities by Mode With Canada:**  
**1996**

**United States**

Overall, air and water: U.S. Department of Transportation. Maritime Administration. Office of Statistical and Economic Analysis. Special tabulation based on U.S. Department of Commerce. U.S. Census Bureau. Foreign Trade Division. *U.S. Imports and Exports of Merchandise, December 1996*. (Washington, DC: 1998).

Road and rail: U.S. Department of Transportation. Bureau of Transportation Statistics. *Transborder Surface Freight Data*. (Washington, DC: 1998).

See notes for Table 6-1c.

**Table 6-8b**  
**Top U.S. Merchandise Trade**  
**Commodities by Mode With Mexico:**  
**1996**

**United States**

Overall, air and water: U.S. Department of Transportation. Maritime Administration. Office of Statistical and Economic Analysis. Special tabulation based on U.S. Department of Commerce. U.S. Census Bureau. Foreign Trade Division. *U.S. Imports and Exports of Merchandise, December 1996*. (Washington, DC: 1998).

Road and rail: U.S. Department of Transportation. Bureau of Transportation Statistics. *Transborder Surface Freight Data*. (Washington, DC: 1998).

See notes for Table 6-1c.

## **SECTION 7: INTERNATIONAL MERCHANDISE TRADE BETWEEN NORTH AMERICA AND THE REST OF THE WORLD**

In all the tables in this section, intra-North American trade is excluded (e.g., Canada's trade with Mexico and the United States is excluded; Mexico's trade with Canada and the United States is excluded; and the United State's trade with Mexico and Canada is excluded). For the series of weight based commodity tables (7-5), data were not available for Mexico that excluded trade with Canada and the United States. A table for Mexico has been included in the technical notes section for the table series 7-5, which provides data for Mexico's top international trade commodities by weight for *all* of its international trade. This table is included between the Canadian and U.S. technical notes for Tables 7-5a and 7-5b.

### **Table 7-1 International Merchandise Trade Between North America and the Rest of the World by Value**

#### **Canada**

Statistics Canada. International Trade Division. Special tabulations. (Ottawa, Ont.: 1998).

See notes for Table 6-1a and 7-1.

#### **Mexico**

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Estadística. Dirección de Estadísticas Económicas. Based on data developed through an interagency working group including the Secretaría de Hacienda y Crédito Público, Banco de México and Instituto Nacional de Estadística, Geografía e Informática. (Mexico City, D.F.: 1999).

Data refer to exports to and imports from outside North America: i.e., Canada and the United States are excluded. Figures are preliminary and approximate, and stem from a study made by Instituto Nacional de Estadística, Geografía e Informática, based on foreign trade data tapes provided by the Secretaría de Hacienda y Crédito Público. Other modes of transportation include mail and miscellaneous modes.

#### **United States**

Air and water: U.S. Department of Transportation. Maritime Administration. Office of Statistical and Economic Analysis. Special tabulation based on U.S. Department of Commerce. U.S. Census Bureau. Foreign Trade Division. *U.S. Imports and Exports of Merchandise, December 1990, 1995 and 1996*. (Washington, DC: 1998).

See also notes for Tables 6-1c.

*Method of transportation:* Method of transportation is based on the method of transportation in use when the merchandise arrived at the U.S. Customs port of entry or departed a U.S. Customs port of exit. Data in Table 7-1 exclude U.S. trade with Canada and Mexico. For Table 7-1, data are only available for air and water modes of transportation, and the total trade represents a sum of these two modes.

In some instances, shipments between the United States and countries abroad enter or depart the United States through Canada or Mexico. These are called transshipments. Such transshipments are recorded under the method of transportation by which they enter or depart a U.S. Customs port regardless of the transportation mode used between Canada or Mexico and the final country of origin or destination. For U.S. exports via Canada to other overseas countries, the mode reported would be the mode used to cross the U.S./Canadian border. If, for example, export shipments that are destined for the United Kingdom travel by truck through Buffalo/Niagara, NY, and are then shipped by water from a Canadian port to the United Kingdom, the mode reported in U.S. international trade data would be truck.

For the time period April 1993 through December 1996, transshipments were included in official U.S. trade data with Canada and Mexico for land modes of transportation, and it is impossible to exclude these transshipments at an individual modal level. Therefore, data are nonexistent for land modes of transportation (road, rail, pipeline and other) for Table 7-1. Beginning in January 1997, transshipment totals by truck and rail, became available for the value of U.S. transshipments through Canada and Mexico. Data for these are included in the monthly detailed data files of the Bureau of Transportation Statistics' *Transborder Surface Freight Data* ([www.bts.gov/transborder](http://www.bts.gov/transborder))

**Table 7-2**  
**International Merchandise Trade**  
**Between North America and the Rest**  
**of the World by Weight**

#### **Canada**

Statistics Canada. International Trade Division. Special tabulations. (Ottawa, Ont.: 1998).

See also notes for Tables 6-1a and 6-2a.

*Method of transportation, imports:* For imports, the mode of transport information represents the last mode of transport by which the cargo was transported to the port of clearance in Canada and is derived from the cargo control documents of Canadian Customs. This may not be the mode of transport by which the cargo arrived at the Canadian port of entry, if the cargo are cleared by Canadian Customs at an inland port. If, for example, commodities imported from the United Kingdom arrived by ship in Toronto, Ont., but are not cleared in Canada until they reach another city by truck, the mode reported in Canadian international trade statistics will be truck.

*Method of transportation, exports:* Exports by land modes of transportation in this table represent Canadian trade with a second country that were transshipped via a third country, generally the United States. For exports, the mode of transport information represents the mode of transport by which the international boundary is crossed. For Canadian exports via the United States to other overseas countries, the mode reported would be the mode used to cross the Canadian/U.S. border. If, for example, export shipments that are destined for the United Kingdom travel by truck through Fort Erie, Ontario, and are then shipped by water from a U.S. port to the United Kingdom, the mode reported in Canadian international trade data in this table will be truck.

## Mexico

The following table provides data for Mexico's overall international trade by mode, measured in millions of metric tons. Data in this table *include* trade with Canada and the United States.

### Mexico's International Merchandise Trade by Weight

(Millions of metric tons)

	Mexico		
	1990	1995	1996
<b>Total trade</b>	U	U	U
Exports	U	U	U
Imports	U	U	U
<b>Air trade, total</b>	0.1	0.2	U
Exports	U	U	U
Imports	U	U	U
<b>Water trade, total</b>	107.9	123.0	145.1
Exports	88.9	103.3	117.6
Imports	19.0	19.7	27.5
<b>Road trade, total</b>	17.7	33.5	U
Exports	7.7	14.4	U
Imports	10.0	19.1	U
<b>Rail trade, total</b>	16.2	21.7	28.6
Exports	4.4	7.0	9.1
Imports	11.8	14.7	19.5

U = Data are unavailable.

**Air:** Cargo carried by domestic and foreign companies under scheduled international service. Freight charters are excluded.

**Water:** Data comprise cargo shipments through the ports of the Pacific, the Gulf of Mexico and the Caribbean.

**Road:** Data refer to international shipments that were shipped via the Mexican federal highway system. Data for 1995 were unavailable. Data in the table represent 1994.

**Rail:** Cargo imported and exported without making any distinction whether bound to the United States or Canada.

### Sources

**Air:** Secretaría de Comunicaciones y Transportes. Dirección General de Aeronáutica Civil. *La Aviación Mexicana en Cifras, 1989-1995*. (Mexico City, D.F.: 1996).

**Water:** Secretaría de Comunicaciones y Transportes. Coordinación General de Puertos y Marina Mercante. *Los Puertos Mexicanos en Cifras 1990-1996*. (Mexico City, D.F.: 1997).

**Road:** Instituto Mexicano del Transporte. *Manual Estadístico del Sector Transporte, 1997*. (Querétaro, Qro.: 1998).

**Rail:** Ferrocarriles Nacionales de México. *Series estadísticas 1990, 1995 and 1996*. (Mexico City, D.F.: various years).

## United States

Air and water: U.S. Department of Transportation. Maritime Administration. Office of Statistical and Economic Analysis. Special tabulation based on U.S. Department of Commerce. Census Bureau. Foreign Trade Division. *U.S. Imports and Exports of Merchandise, December 1990, 1995 and 1996*. (Washington, DC: 1998).

See also notes for Tables 6-1c and 6-2c.

Method of transportation: Method of transportation is based on the method of transportation in use when the merchandise arrived at the U.S. Customs port of entry or departed a U.S. Customs port of exit. Data in Table 7-2 exclude U.S. trade with Canada and Mexico. For Table 7-2, data are only available for air and water modes of transportation, and the total trade represents a sum of these two modes.

In some instances, shipments between the United States and countries abroad enter or depart the United States through Canada or Mexico. These are called transshipments. Such transshipments are recorded under the method of transportation by which they enter or depart a U.S. Customs port regardless of the transportation mode used between Canada or Mexico and the final country of origin or destination. For U.S. exports via Canada to other overseas countries, the mode reported would be the mode used to cross the U.S./Canadian border. If, for example, export shipments that are destined for the United Kingdom travel by truck through Buffalo/Niagara, NY, and are then shipped by water from a Canadian port to the United Kingdom, the mode reported in U.S. international trade data would be truck.

For the time period April 1993 through December 1996, transshipments were included in official U.S. trade data with Canada and Mexico for land modes of transportation, and it is impossible to exclude these transshipments at an individual modal level. Therefore, data are nonexistent for land modes of transportation (road, rail, pipeline and other) for Table 7-2.

### Table 7-3a

#### **Top Canadian International Merchandise Trade Gateways by Mode: 1996 (Excluding Trade With Mexico and the United States)**

(Current U.S. dollars)

#### **Canada**

Statistics Canada. International Trade Division. Special tabulations. (Ottawa, Ont.: 1998).

See notes for Table 6-1a and 7-1.

### Table 7-3b

#### **Top U.S. International Merchandise Trade Gateways by Mode: 1996 (Excluding Trade With Canada and Mexico)**

(Current U.S. dollars)

#### **United States**

Air: U.S. Department of Commerce. U.S. Census Bureau. Foreign Trade Division. Transportation Branch. Special tabulation. (Washington, DC: 1998).

Water: U.S. Department of Transportation. Maritime Administration. Office of Statistical and Economic Analysis. *Annual Waterborne Databanks 1996* (formerly TA 305/705). (Washington, DC: 1998).

For additional explanation, see notes for Table 6-1c and 7-1.

Air data for specific airports may include a low (generally less than 2-3 percent of the total value) level of small user-fee airports located in the same regional area. In addition, data for nearby individual courier operations are included in the certain airport totals to prevent disclosure. Port totals reflect the mode of transportation (air or water) in use at the time the shipment entered or exited a U.S. Customs port.

**Table 7-4a**  
**Top Canadian International Trade**  
**Commodities by Value: 1996 (Excluding**  
**Trade With Mexico and the United**  
**States)**

(Current U.S. dollars)

**Canada**

Statistics Canada. International Trade Division. Special tabulations. (Ottawa, Ont.: 1998).

See notes for Table 6-1a and 7-1.

**Table 7-4b**  
**Top Mexican International Trade**  
**Commodities by Value: 1996**  
**(Excluding Trade With the United**  
**States and Canada)**

(Current U.S. dollars)

**Mexico**

Instituto Nacional de Estadística, Geografía e Informática. Dirección General de Estadística. Dirección de Estadísticas Económicas. Based on data developed through an interagency working group including the Secretaría de Hacienda y Crédito Público, Banco de México and Instituto Nacional de Estadística, Geografía e Informática. (Mexico City, D.F.: 1999).

**Table 7-4c**

**Top U.S. International Trade**  
**Commodities by Value: 1996 (Excluding**  
**Trade With Canada and Mexico)**

(Current U.S. dollars)

**United States**

Overall, air and water: U.S. Department of Transportation. Maritime Administration. Office of Statistical and Economic Analysis. Special tabulation based upon U.S. Department of Commerce. U.S. Census Bureau. Foreign Trade Division. *U.S. Imports and Exports of Merchandise, December 1990, 1995 and 1996*. (Washington, DC: 1998).

See notes for Table 6-1c and 7-1.

**Table 7-5a**

**Top Canadian International Trade**  
**Commodities by Weight: 1996**  
**(Excluding Trade With Mexico and the**  
**United States)**

**Canada**

Statistics Canada. International Trade Division. Special tabulations. (Ottawa, Ont.: 1998).

See notes for Tables 6-1a, 6-2a and 7-2.

**Top Mexican International Trade**  
**Commodities by Weight: 1996**

**Mexico**

International trade data excluding trade with Canada and the United States are not available with commodity detail. The table below shows *all* international merchandise trade for Mexico by weight. The headings of each column indicate the year. (Data are *not* based on the two-digit Harmonized Schedule (HS) but on the common name of the product.)

**Top Mexican International Trade  
Commodities by Weight, Various Years**  
(Thousands of metric tons)

OVERALL	1993
<b>Exports</b>	<b>108,079</b>
Crude oil	69,117
Regular salt	6,200
Fuel oil	3,117
Gypsum	2,869
Bar or ingot iron	1,379
<b>Imports</b>	<b>50,144</b>
Fuel oil	4,364
Sorghum	3,745
Soybean seed	2,171
Wheat	1,741
Cellulose pulp for paper manufacturing	1,510
AIR	
<b>Air exports</b>	
U	U
<b>Air imports</b>	
U	U
LAND (rail only)	1995
<b>Land exports (rail only)</b>	<b>5,482</b>
Assembled motor vehicles	1,348
Cement	1,078
Beer	548
Disassembled motor vehicles	130
Iron and steel sheets and plates	389
<b>Land imports (rail only)</b>	<b>12,933</b>
Soybeans	1,406
Maize	1,257
Paper and cardboard waste	917
Wheat	601
Sorghum	582
WATER	1996
<b>Water exports</b>	<b>117,598</b>
Oil and by-products	82,662
Regular salt	7,270
Limestone	5,978
Gypsum	3,587
Cement	1,874
<b>Water imports</b>	<b>27,533</b>
Oil and by-products	4,857
Limenite	3,797
Sorghum	1,311
Wheat	1,104
Phosphoric rock and fertilizer	967

**Sources**

Overall: Instituto Mexicano del Transporte. *Manual Estadístico del Sector Transporte, 1996.* (Sanfandila, Qro.: 1998). Based on the *Sumario Estadístico de la Revista Comercio Exterior*, April 1993 and March 1994, Banco Nacional de Comercio Exterior.

Land (rail only): Instituto Mexicano del Transporte. *Manual Estadístico del Sector Transporte, 1996.* (Sanfandila, Qro.: 1998). Based on information from Ferrocarriles Nacionales de México.

Water: Instituto Mexicano del Transporte. *Manual Estadístico del Sector Transporte, 1996.* (Sanfandila, Qro.: 1998). Based on information from the Secretaría de Comunicaciones y Transportes, Dirección General de Puertos y Marina Mercante; i.e., based on information from the Secretaria de Comunicaciones y Transportes, Dirección General.

**Table 7-5b**  
**Top U.S. International Trade**  
**Commodities by Weight: 1996**  
**(Excluding Trade With Canada and**  
**Mexico)**

**United States**

Overall, air and water: U.S. Department of Transportation. Maritime Administration. Office of Statistical and Economic Analysis. Special tabulation based upon U.S. Department of Commerce. U.S. Census Bureau. Foreign Trade Division. *U.S. Imports and Exports of Merchandise, December 1990, 1995 and 1996.* (Washington, DC: 1998).

See notes for Table 6-1c, 6-2c and 7-2.

## SECTION 8: DOMESTIC PASSENGER TRAVEL

Data do not include passenger travel by commercial freight vehicles.

**Table 8-1**  
**Domestic Passenger Travel by Mode**

### Canada

Table 8-1 is based on the following primary sources:

Air: Statistics Canada. *Canadian Civil Aviation, Catalogue 51-206-XPB*. (Ottawa, Ont.: various years).

Road: Transport Canada. Minister of Public Works and Government Services. *Transportation in Canada 1997—Annual Report*. (Ottawa, Ont.: 1998).

Rail: Statistics Canada. *Rail in Canada, Catalogue 52-216-XPB*. (Ottawa, Ont.: various years).

*Passenger-kilometers, total*: The total is approximate because it is dominated by an estimated number for road, and because data for general aviation do not exist. (Transit also is estimated, and placed under Local Motor Bus, under Road.)

Air: Air data reflect Canadian Level I through Level III air carriers that, in each of the 2 calendar years immediately preceding the report year, transported 5,000 or more revenue passengers, or 1,000 or more metric tons of revenue goods, between airports located within Canada. Data for general aviation/noncommercial passenger travel do not exist because this type of information is not collected. As a result, a total for domestic passengers transported by the air mode of transport in Canada is also nonexistent.

Road: Road passenger-kilometer data are based on a Transport Canada estimate for 1995 of the number of vehicle-kilometers traveled by personal motor vehicles (includes passenger cars, motorcycles and light trucks) and buses. Estimates of vehicle-kilometers are calculated based on: (1) road motor vehicle fuel sales (net sales on which taxes were paid at road-use rates); and (2) estimates of fuel efficiency by class of vehicle. Estimates of average occupancy are then applied to the estimates of vehicle-kilometers to arrive at passenger kilometers. Buses include inter-city, charter, school and local transit buses.

Rail: Rail data include Class I (VIA Rail) and Class II (other carriers involved in Canadian rail passenger transportation operations) Canadian railways.

### Mexico

Air: Secretaría de Comunicaciones y Transportes. Dirección General de Aeronáutica Civil. (Mexico City, D.F.: 1998).

Road: Secretaría de Comunicaciones y Transportes. Dirección General de Autotransporte Federal. (Mexico City, D.F.: 1997).

Rail: Ferrocarriles Nacionales de México. *Series Estadísticas, 1990, 1995 and 1996*. (Mexico City, D.F.: various years).

Water: Secretaría de Comunicaciones y Transportes. Coordinación General de Puertos y Marina Mercante (Mexico City, D.F.: 1998)

For all data included in Table 8-1, the distances used to estimate indicators; i.e., passenger-kilometers, were based on routes and traffic intensities.

Air: Data include only domestic airlines with scheduled service. General aviation activity is not included.



*Bus, total and intercity:* Data for all types of buses are nonexistent, because these data are not collected. In Table 8-1 only data for intercity buses are reported. These buses use Mexico's federal highway system, and do not include local transit buses. Intercity bus data for passenger-kilometers are estimates based on the size of the vehicle fleet and the following formula:

Passengers—kilometers = passengers transported x distance traveled.

Passengers transported = vehicle fleet x used capacity x trips per week x weeks per year

The vehicle fleet is the number of vehicles that move passengers on the federal road system. Used capacity is the average number of used seats per vehicle. Trips per week is the average number of trips per vehicle per week. Weeks per year is the average number of weeks an intercity bus is in service during the year. Distance traveled is the distance between the origin and destination of the bus.

### United States

Table 8-1 is based on the following primary sources:

#### Air:

Air carrier: U.S. Department of Transportation. Bureau of Transportation Statistics. Office of Airline Information. *Air Carrier Traffic Statistics*. (Washington, DC: 1986-1997). Page 2, Line 1.

General aviation: U.S. Department of Transportation. Federal Aviation Administration. Statistical Handbook of Aviation 1996, available at [www.bts.gov](http://www.bts.gov).

#### Road:

1990, 1995: U.S. Department of Transportation. Federal Highway Administration. *High-*

*way Statistics, Summary to 1995*. (Washington, DC: 1996). Table VM-201A.

1996: U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, 1996*. (Washington, DC: 1997). Table VM-1.

Local motor bus: American Public Transit Association (APTA). *Transit Fact book*. (Washington, DC: various years).

Intercity passenger rail: National Railroad Passenger Corp. *Amtrak Annual Report 1996*. (Washington, DC: 1996), statistical appendix.

Transit rail: American Public Transit Association. *Transit Fact Book*. (Washington, DC: various years).

*Air:* Air data comprise air carrier and general aviation passenger-kilometers. Air carrier data in the United States are based on 100 percent reporting of passengers and trip length by the large certificated air carriers (including the medium regional carriers). There are some 90 air carriers that operate aircraft with a passenger seating capacity of more than 60, or have a payload capacity of more than 8,165 kilograms, or operate internationally. (See the technical notes under Table 4-2 for more information on large certificated air carriers.) The figures do not include data for all airlines; most notably, small certificated air carriers, scheduled commuter airlines and on-demand air taxis are excluded. If added, these might raise the totals by roughly 5 percent. Air carrier passenger-kilometers are computed by summing the aircraft kilometers flown on each inter-airport segment multiplied by the number of passengers carried on that segment. Passenger-kilometers for general aviation (which in this table includes on-demand air taxi) are calculated by increasing earlier figures by the percentage change in annual hours flown by general aviation aircraft, as published in the

Federal Aviation Administration's *Statistical Handbook of Aviation*.

**Road:** Road data are based on statistics compiled by the Federal Highway Administration (FHWA) at the U.S. Department of Transportation from data reported by each state. Road passenger-kilometers are calculated by multiplying the vehicle kilometers of travel by the average number of occupants for each vehicle type (as estimated by FHWA, using various sources, especially, the Nationwide Personal Transportation Survey). The quality of the data varies by the level of the functional road system and by each state's effort and adherence to FHWA methods. FHWA edits reports that are unreasonable because of obvious errors or large changes. In July 1997, FHWA published revised passenger-kilometers data for the road mode for several years. The major change reflected the reassignment of some vehicles from the passenger car category to the FHWA category "other 2-axle, 4-tire vehicles" (called "light truck" in this table). Light trucks include vans, pickup trucks, minivans and sport utility vehicles. Passenger cars include taxis. Bus totals are based on data from the FHWA and include charter, intercity, local motor bus and school bus. Local motor bus is based on data from a private association, and is described under transit. Road data *do not* include passenger travel by commercial freight vehicles.

**Transit:** Transit data are from the American Public Transit Association (APTA) and are based on information in the Federal Transit Administration's (FTA) National Transit Database. APTA conservatively adjusts the FTA data to include transit operators that do not report to this database. These nonreporting operators typically include private, very small and/or rural operators. There are about 6,000 transit operators in the U.S., according to APTA; about 1,000 of these report to FTA. However, these 1,000 operators ac-

count for approximately 90 to 95 percent of the total transit passenger-kilometers. Reliability of the U.S. transit data varies by mode. The numbers for rail are the most comprehensive; those for bus are less so because there are so many more operators. Transit passenger-kilometers are the cumulative sum of the distances ridden by each passenger. Transit total includes other U.S. transit categories not individually specified here, including local motor bus, trolley bus, ferries and transit for the disabled. Transit rail includes commuter rail, heavy rail and light rail. Local motor bus included here is not included in the total to avoid double counting with the estimate of bus passenger vehicle-kilometers in the road data.

**Intercity rail:** Intercity rail data are based on an almost 100 percent count of tickets from the service provider in the United States (Amtrak) and, therefore, are considered to be very accurate.

**Table 8-2a**  
**Top Canadian Domestic Passenger**  
**Metropolitan Area Pairs by Mode: 1996**

**Canada**

**Air:** Statistics Canada. *Air Passenger Origin and Destination, Domestic Report—1996, Catalogue 51-204-XPB*. (Ottawa, Ont.: 1997).

**All other modes:** Statistics Canada. *Micro Data Files relating to the Canadian Travel Survey (CTS)—1996, Catalogue 87M006XCB*. (Ottawa, Ont.: 1998).

**Air:** Air data in this table are based on scheduled domestic air passenger journeys by air carriers, as collected by the *Passenger Origin Destination Survey*. Air carrier figures refer to total outbound and inbound domestic passenger journeys in 1996. Statistics Canada's Aviation Statistics Centre developed

the *Passenger Origin-Destination Survey* to collect air passenger statistics. The *Air Passenger Origin and Destination Report, Catalogue 52-204-XPB*, is published annually to provide estimates, by directional origin and destination, of the number of passengers traveling on scheduled domestic commercial flights. These passenger counts are reported by major (Level I and certain Level II) air carriers to the *Passenger Origin-Destination Survey*. Approximately 85 percent of the total commercial air passengers in Canada are serviced by air carriers that participate in the *Passenger Origin-Destination Survey*. Data for general aviation/noncommercial passenger travel do not exist because this type of information is not collected. As a result, top metropolitan area pairs for domestic passengers transported by all air modes of transport in Canada is also nonexistent.

The data in Table 8-2a are based on passengers flown by Level I and Level II Canadian air carriers. To qualify as a Level I carrier, the carrier must have transported at least 1,000,000 revenue passengers or at least 200,000 metric tons of revenue goods in each of the 2 calendar years immediately preceding the report year. (Level I carriers are divided into Level IA and Level IB, with IA the larger.) Level II carriers must have transported at least 50,000 revenue passengers or at least 10,000 metric tons of revenue goods in each of the 2 calendar years immediately preceding the report year.

*Intercity rail/road/water:* Data in this table for Intercity Rail, Road, and Water are based on “person-trips,” as collected by Statistics Canada for its *Canadian Travel Survey (CTS)*. These figures refer to total outbound and inbound domestic passenger trips in 1996. For purposes of the *CTS*, a “trip” is defined as travel by the respondent accompanied or

not by one or more household members for any reason (except as noted below) to a Canadian destination of at least 80 kilometers one-way from home. The following types of travel are excluded: travel to and from work or school (i.e., commuting); one-way travel involving a change of residence; travel of operating crew members of buses, airplanes, boats, etc; travel in an ambulance to a hospital or clinic; trips that did not originate in Canada; trips longer than a year.

The *Canadian Travel Survey* is a biennial survey whose purpose is to gather information on domestic trips and travelers to measure the volume, characteristics and economic impact of domestic travel by Canadians. The CTS is a supplement using the *Labour Force Survey (LFS)* sampling frame and collects more than 30 characteristics, including socio-demographic information on travelers, trips and expenditures. In 1996, a monthly sample of approximately 16,000 persons was interviewed. That same year, additional information was also collected. For the first time, the *CTS* measured the number of visits and provided allocated expenditures at the national, provincial and subprovincial level. The results of the *Canadian Travel Survey* are published in *Touriscope-Domestic Travel* (Catalogue 87-504), which is prepared by the Tourism Statistics Program of Statistics Canada.

**Table 8-2b**  
**Top Mexican Domestic Passenger**  
**Metropolitan Area Pairs by Mode: 1996**

**Mexico**

*Air:* Instituto Mexicano del Transporte based on data from Secretaría de Comunicaciones y Transportes. Dirección General de Aeronáutica Civil. (Querétaro, Qro.: 1998).

*Intercity rail and bus:* Data for 1996 are for passenger travel by interurban railroad and by bus are presented below for the principal

terminals. The objective is to provide an idea of the geographical distribution of passenger flows within Mexico by bus and rail.

### **Intercity Passenger Rail, 1996**

(Thousands of passengers utilizing specific terminals)

Name of passenger rail terminal	Thousands of passengers utilizing specific terminals, 1996
Mexico City, D.F.	728
Veracruz, Ver.	181
Guadalajara, Jal.	171
Monterrey, N.L.	160
Chihuahua, Chih.	141

Instituto Mexicano del Transporte based on data from Ferrocarriles Nacionales de México (Querétaro, Qro. 1998)

### **Intercity Passenger Bus, 1996**

(Thousands of passengers utilizing specific terminals)

Name of passenger bus terminal	Thousands of passengers utilizing specific terminals, 1996
Mexico City, D.F.	
Mexico City, D.F. (Terminal del Norte)	22,851
Mexico City, D.F. (Terminal Oriente)	17,164
Guadalajara, Jal.	16,501
Celaya, Gto.	13,799
Monterrey, N.L.	12,576
Acapulco, Gro.	10,087

Secretaría de Comunicaciones y Transportes. Dirección General de Autoransporte Federal. *Estadísticas Básicas del Autotransporte Federal, 1996.* (Mexico City, D.F. 1997)

Water: Secretaría de Comunicaciones y Transportes. Coordinación General de Puertos y Marina Mercante. (Mexico City, D.F.: 1998).

*Air and water:* Air carrier is an Instituto Mexicano del Transporte estimate based on data provided from Secretaría de Comunicaciones y Transportes. Dirección General de Aeronáutica Civil. Water data represent port pairs.

**Table 8-2c**  
**Top U.S. Domestic Passenger**  
**Metropolitan Area Pairs by Mode: 1995**

**United States**

U.S. Department of Transportation. Bureau of Transportation Statistics. *1995 American Travel Survey*. Special tabulation. (Washington, DC: 1996).

Conducted in 1995, the Bureau of Transportation Statistics' American Travel Survey (ATS) collected data on trips of 100 miles or more one-way made by U.S. residents. Flows between places less than 100 miles apart are not included in the data set. Flows are based on person trips between metropolitan areas. For more information on the ATS, see the web site: [www.bts.gov/ats](http://www.bts.gov/ats)

**SECTION 9: NORTH AMERICAN PASSENGER TRAVEL**

Canada and Mexico both collect data on same day and overnight international travel from travel surveys and other sources. However, the data sources for each country may differ in definitions and methodologies. Both Canada's and Mexico's data are based on country of residency. Residents of a country are those people that are entitled to live permanently in that country. For the purposes of the

travel data included in this section, resident travel would include travel by both citizens of the particular country, as well as, residents of that country.

The United States does not collect data on same day and overnight travel to and from the United States for all modes of transportation, and with the same level of travel characteristics that Canada and Mexico do. The International Trade Administration's *Survey of International Air Travelers* captures travel characteristics data for U.S. residents traveling abroad and for international visitors to the United States. However, the survey only captures travel by air. The Bureau of Transportation Statistics' *American Travel Survey* captures data on international travel of U.S. residents by all modes of transportation. However, the distance basis of the ATS (trips of 100 miles or more) limits its utility in the North American context, since the majority of U.S.-Canada and U.S.-Mexico travel is same day travel with trips of less than 100 miles. Because of these and other data gaps, the United States agreed to use Canadian data to represent U.S.-Canada travel and Mexican data to represent U.S.-Mexican data.

**Table 9-1a**  
**Canada-Mexico/Mexico-Canada Travel**  
**by Mode of Transportation**

**Canada**

Statistics Canada. *International Travel, Travel between Canada and other countries (Touriscope), Catalogue 66-201-XPB*. (Ottawa, Ont.: various years).

*Data sources:* The Tourism Statistical Program at Statistics Canada collects, analyzes and disseminates data on tourism. Tourism is broadly defined as the business, pleasure and leisure activities that support a person

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travelling abroad. The existing method of collecting international travel statistics is described under the two Statistics Canada headings of "Frontier Counts" and "Questionnaire Surveys." Both these systems depend greatly on the cooperation of Revenue Canada, Customs and Excise in the collection of the number of crossings and the distribution of travel questionnaires. Except for Tables 9-2a and 10-1, all data in Sections 9 and 10 are based on a combination of frontier count and questionnaire sampling. Data for all tables in Section 9 are based on travel from Canada by Canadian residents and on travel to Canada by U.S. or Mexican residents.

*Frontier count data:* All ports of entry across Canada participate in determining the number of travelers by selected categories, by type of transportation, as well as the number of cars, trucks, motorcycles and bicycles in the case of highway and ferry points. These surveys are conducted on a census basis except for seven ports of entry that are using sampling schemes to estimate automobiles and motorcycle flows. The sample is intended to estimate U. S. and Canadian vehicles and travelers by country of residence. The samples are selected among the seven ports in order to represent all days of the month over the region. Custom officials at these ports provide the count of automobiles and cycle traffic by country of residence for those sample days. These counts are then weighted to the total flows provided by toll authorities.

*Questionnaire surveys:* Questionnaire surveys are used to secure information on the expenditures and other characteristics of an international traveler. According to prearranged schedules, Canadian Customs distributes the questionnaires to the travel party upon entry for nonresidents or upon reentry for Canadian residents. As part of a continuing at-

tempt to improve travel surveys at minimal cost, a sampling scheme is used at all major land and air border points where a questionnaire is distributed to eligible travelers over a period of several days. Each port involved in the sampling scheme receives, for a specified period, a specific quantity of numbered questionnaires and a date on which to start the distribution. For estimation purposes, the responses obtained through the questionnaire surveys are treated as a simple random sample from the total traffic in each stratum (port or group of ports, by type of traffic, by quarter). The data may in fact be subjected to some degree of "distribution bias," due to the fact that not all categories of travelers are represented, or to a "nonresponse bias" due to the fact that the individuals replying may not be representative of the population.

Data from questionnaire surveys are captured and disseminated on the basis of person-trips. (Each time a nonresident traveler enters Canada marks the beginning of a person-trip. Canada Customs records each traveler's entry. A person-trip concludes when the traveler leaves Canada. For residents, each time a person departs from Canada, a person-trip begins. The person-trip ends when the traveler returns to Canada.) However, for the purposes of comparability with Mexican and U.S. data, data in Sections 9 and 10 is reported on the basis of visitors, unless otherwise noted.

## **Mexico**

Banco de México. Dirección General de Investigación Económica. Dirección de Medición Económica. (Mexico City, D.F.: 1999).

*Data sources:* The Banco de México is the responsible agency for collecting the majority of international travel data in Mexico. Most of these data are collected through survey

instruments. Overall, the goals of the Banco de México tourism survey program are to collect tourism data as part of the calculation of the balance of payments and to collect other information in order to analyze the behavior of tourists. To support these goals, data on expenditures for local transportation, lodging, food, amusement, personal care items, souvenirs, medical care and other purchases are gathered. In addition, data such as length of stay, income level, purpose of trip, means of transportation, point of departure and major cities visited also are gathered. Through a sample survey, data are collected at specific international airports and border cities. Data are collected from travelers in automobiles, buses, trains, as well as travelers boarding and deboarding aircraft. Each individual traveler is surveyed when leaving the country.

For the purposes of its own survey program, the Banco de México uses specific definitions to categorize types of visitors. However, due to the need for use of common terminology in Sections 9 and 10, some standard categories were used for the data tables. The category “Mexican Resident Overnight Travel to Canada” includes Mexican resident travelers who traveled from Mexico to Canada where they stayed for at least 24 hours. The category “Canadian Resident Overnight Travel to Mexico” includes Canadian resident travelers who traveled from Canada to Mexico where they stayed for at least 24 hours.

**Table 9-1b**  
**Canada-United States/United States-Canada Travel by Mode of Transportation**

**Canada**

Statistics Canada. *International Travel, Travel between Canada and other countries*

(*Touriscope*), *Catalogue 66-201-XPB*. (Ottawa, Ont.: various years).

See technical notes for Table 9-1a.

**United States**

For purposes of this publication, the United States and Canada have agreed to use Canadian source data for this table. However, the American Travel Survey (ATS) is another source that provides data for trips made by U.S. residents to Canada of more than 100 miles one-way in 1995. The ATS definition of a visitor, therefore, results in a much lower estimate of travel than reflected in the table, particularly for same-day travel. For overnight travel the ATS estimates 9,867,000 U.S. visitors to Canada in 1995, 76 percent of the travel estimated in the table. The ATS estimates a higher proportion of air travel (35 percent versus 21 percent) because, on the whole, it counts longer distance trips than in the table, trips that are more likely to be taken by airplane. The estimates of bus travel are very similar in percentage terms, with the ATS estimating 5 percent of trips versus 6 percent in the table. The ATS estimates 96 percent of bus trips were taken by charter or tour bus, 3 percent by intercity bus and 1 percent by school bus. The ATS estimates less than 1 percent of overnight trips to Canada were taken by intercity rail. For more information on the ATS, see web site: [www.bts.gov/ats](http://www.bts.gov/ats)

**Table 9-1c**  
**Mexico-United States/United States-Mexico Travel by Mode of Transportation**  
**Mexico**

Banco de México. Dirección General de Investigación Económica. Dirección de Medición Económica. (Mexico City, D.F.: 1999).

See technical note on Table 9-1a for additional information on data sources.

The category “Mexican Resident Same Day Travel to the U.S.” includes Mexican resident travelers who traveled from Mexico to the United States and who stayed within the border region (the border region extends 25 miles (40 kilometers) from the U.S./Mexican border). The category “U.S. Resident Same Day Travel to Mexico” includes U.S. resident travelers who traveled from the United States to Mexico and who stayed within the border region. The category “Mexican Resident Overnight Travel to the U.S.” includes Mexican resident travelers who traveled from Mexico to the United States and who stayed in the United States for at least 24 hours. This includes Mexican residents who stayed within the border region, as well as those who traveled further inland into the United States for a minimum period of 24 hours. The category “U.S. Resident Overnight Travel to Mexico” includes U.S. resident travelers who traveled from the United States to Mexico and who stayed in Mexico for at least 24 hours. This includes U.S. residents who stayed within the border region, as well as those who traveled further inland into Mexico for a minimum period of 24 hours.

### United States

For purposes of this publication, the United States and Mexico have agreed to use Mexican source data for this table. The American Travel Survey (ATS) provides data for trips made by American residents to Mexico of more than 100 miles one-way in 1995. The ATS definition of a visitor, therefore, results in a much lower estimate of travel than reflected in the table, particularly for same-day travel. For overnight travel the ATS estimates 8,561,000 U.S. visitors to Mexico in 1995, 45 percent of the travel estimated in the table. The ATS estimates a higher proportion of air travel because it counts longer

distance trips than in the table, trips that are more likely to be taken by airplane. The only estimates of bus travel are from the ATS, which estimates bus accounts for 3 percent of trips. The ATS estimates 51 percent of bus trips were taken by charter or tour bus, 46 percent by intercity bus and 3 percent by school bus. The ATS estimates less than 1 percent of overnight trips to Mexico were taken by intercity rail. For more information on the ATS, see <http://www.bts.gov/ats>

**Table 9-2a**  
**Top Land Passenger Ports, Canadian-U.S. Border: 1996**

Northbound (Canadian data source): Statistics Canada. Culture, Tourism and the Center for Education Statistics Division. Special tabulations. (Ottawa, Ont.: 1998). Table 9-2a is based on data collected through Statistics Canada’s Frontier Count program. These data provide information on the number of travelers by selected categories and by type of transportation. All ports of entry across Canada participate in determining the number of travelers by selected categories, by type of transportation, as well as the number of cars, trucks, motorcycles and bicycles in the case of highway and ferry points. These surveys are conducted on a census basis except for seven ports of entry that are using sampling schemes to estimate automobiles and motorcycle flows. The sample is intended to estimate United States and Canadian vehicles and travelers by country of residence. The samples are selected among the seven ports in order to represent all days of the month over the region. Custom officials at these ports provide the count of automobiles and cycle traffic by country of residence for those sample days. These counts are then weighted to the total flows provided by toll authorities.



Southbound (U.S. data source). U.S. Department of Treasury. U.S. Customs Service. Office of Field Operations. *Operations Management Database*. Special tabulation. (Washington, DC: 1998).

Data reflect all passenger vehicles and passengers in those vehicles that entered the United States across the U.S.-Canadian border, regardless of nationality.

**Table 9-2b**  
**Top Land Passenger Ports, Mexican-U.S. Border: 1996**

Northbound (U.S. data source): U.S. Department of Treasury. U.S. Customs Service. Office of Field Operations. *Operations Management Database*. Special tabulation. (Washington, DC: 1998).

Data reflect all passenger vehicles and passengers that entered the United States across the U.S.-Mexican border, regardless of nationality.

Southbound: Data compiled by Texas A&M International University, Texas Center for Border Economic and Enterprise Development based on original data from bridge operators. Web site: [www.tamui.edu/coba/txcntr/](http://www.tamui.edu/coba/txcntr/)

**Table 9-3**  
**Top North American Air Passenger City Pairs: 1996**

**Canada-United States and  
Mexico-United States**

U.S. Department of Transportation. Bureau of Transportation Statistics. Office of Airline Information. *T-100 Database*. Special tabulation. (Washington, DC: 1998).

Data for this table are based on regulatory reporting requirements for the large certificated U.S. air carriers and for foreign air car-

riers. The large certificated U.S. air carriers are required to report traffic data for all their aircraft operations, regardless of aircraft size. (See the technical notes under Table 4-2 for the definition of “large certificated air carrier.”) By contrast, the United States does not require foreign air carriers operating in the United States, such as Air Canada, to file “small aircraft” traffic operations. In the context of this table, small aircraft have 60 or fewer passenger seats and an available payload capacity (passengers and/or cargo) of 18,000 pounds (8,165 kilograms) or less. The United States requires foreign carriers operating in the United States to report data for aircraft with more than 60 passenger seats or available payload (passengers and/or cargo) of more than 18,000 pounds (8,165 kilograms).

**Table 9-4a**  
**Canada-Mexico/Mexico-Canada Travel by Trip Purpose**

Canadian data source: Statistics Canada. *International Travel, travel between Canada and other countries* (Touriscope), Catalogue 66-201-XPB. (Ottawa, Ont.: various years).

Statistics Canada. Special tabulations. (Ottawa, Ont.: 1998).

Also see notes for Table 9-1a. Under Statistics Canada’s International Travel Program, trip purposes include the following: pleasure, business, visiting friends or relatives and other purposes. A pleasure trip includes a holiday, vacation, visiting second home, cottage or condo and attending events and attractions. A business trip includes attending a meeting or convention, a conference, trade show or seminar, or other work. A trip for other purposes includes personal, in transit, shopping, educational study and other.

Mexican data source: Banco de México. Dirección General de Investigación Económica. Dirección de Medición Económica. (Mexico City, D.F.: 1999).

See notes for Table 9-1a.

**Table 9-4b**  
**Canada-United States/United States-Canada Travel by Trip Purpose**

**Canada**

Statistics Canada. *International Travel, Travel between Canada and other countries (Touriscope), Catalogue 66-201-XPB*. (Ottawa, Ont.: various years).

Statistics Canada. Special tabulations. (Ottawa, Ont.: 1998).

See notes for Table 9-1a and 9-4a.

**Table 9-5a**  
**Canada-Mexico/Mexico-Canada Travel Characteristics: 1996**

**Canada**

Statistics Canada. *International Travel, Travel between Canada and other countries (Touriscope), Catalogue 66-201-XPB*. (Ottawa, Ont.: various years).

Statistics Canada. Special tabulations. (Ottawa, Ont.: 1998).

See notes for Table 9-1a and 9-4a.

**Table 9-5b**  
**Canada-United States/United States-Canada Travel Characteristics: 1996**

**Canada**

Statistics Canada. *International Travel, travel between Canada and other countries (Touriscope), Catalogue 66-201-XPB*. (Ottawa, Ont.: various years).

Statistics Canada. Special tabulations. (Ottawa, Ont.: 1998).

See notes for Table 9-1a and 9-4a.

**SECTION 10: INTERNATIONAL PASSENGER TRAVEL BETWEEN NORTH AMERICA AND THE REST OF THE WORLD**

**Table 10-1**  
**Passenger Travel Between North America and the Rest of the World by Mode of Transportation**

**All Countries**

Canadian, Mexican and U.S. data in this table do not include international travel within North America. All data in this table are based on the traveler's country of residency. Residents of a country are those people that are entitled to live permanently in that country. For the purposes of the travel data included in this section, resident travel would include travel by both citizens of the particular country, as well as, residents of that country. Canadian data represent nonresident visitors to Canada, excluding residents of the United States and Mexico. U.S. data represent nonresident visitors to the United States, excluding residents of Canada and Mexico. Mexican data represent nonresident visitors to Mexico, excluding residents of Canada and the United States.

Travel from the United States is based on the departures of U.S. residents, excluding travel to Canada or Mexico. Travel from Mexico is based on the departures of Mexican residents, excluding travel to Canada or the United States. Travel from Canada is based on Canadian resident reentry data. Canadian resident reentry data represent Canadian residents returning from international destinations, other than the United States or

Mexico. The reentry of Canadian residents to Canada may be made directly from an overseas country or via the United States. Canadian resident reentry data are similar, but not exactly comparable with U.S. and Mexican resident departure data. This is because Canadian residents may not necessarily leave and return by the same modes of transportation, and because Canadian residents could depart Canada in one calendar year, and return in another.

### Canada

Statistics Canada. *International Travel, Travel between Canada and other countries (Touriscope), Catalogue 66-201-XPB*. (Ottawa, Ont.: various years).

Statistics Canada. Special tabulations. (Ottawa, Ont.: 1998).

Table 10-1 is based on data collected through Statistics Canada's Frontier Count program. These data provide information on the number of travelers by selected categories and by type of transportation. All ports of entry across Canada participate in determining the number of travelers by selected categories, by type of transportation, as well as the number of cars, trucks, motorcycles and bicycles in the case of highway and ferry points. These surveys are conducted on a census basis except for seven ports of entry that are using sampling schemes to estimate automobiles and motorcycle flows. The samples are selected among the seven ports in order to represent all days of the month over the region. Custom officials at these ports provide the count of automobiles and cycle traffic by country of residence for those sample days. These counts are then weighted to the total flows provided by toll authorities.

In Table 10-1, Canadian data are based on the traveler's country of residency. Travel

to Canada represents nonresident visitors to Canada, excluding residents of the United States and Mexico. Travel from Canada is based on Canadian resident reentry data. Canadian resident reentry data represent Canadian residents returning from international destinations, other than the United States or Mexico. The reentry of Canadian residents to Canada may be made directly from an overseas country or via the United States. Canadian resident reentry data are similar, but not exactly comparable with U.S. resident departure data. This is because Canadian residents may not necessarily leave and return by the same modes of transportation, and because Canadian residents could depart Canada in one calendar year, and return in another.

### Mexico

Banco de México. Dirección General de Investigación Económica. Dirección de Medición Económica. (Mexico City, D.F.: 1999).

Table 10-1 is based on data collected by the Banco de México. Most of this data are collected through survey instruments. Overall, the goals of the Banco de México tourism survey program are to collect tourism data as part of the calculation of the balance of payments and to collect other information in order to analyze the behavior of tourists. To support these goals, data on expenses on local transportation, lodging, food, amusement, personal care items, souvenirs, medical care and other purchases are gathered. In addition, data such as length of stay, income level, purpose of trip, means of transportation, point of departure and major cities visited also are gathered. Through a sample survey data are collected at specific international airports and border cities. Data are collected from travelers in automobiles, buses, trains, as well as travelers boarding and deboarding

aircraft. Each individual traveler is surveyed when leaving the country.

For the purposes of its own survey program, the Banco de México uses specific definitions to categorize types of visitors. However, due to the need for use of common terminology in Sections 9 and 10, some standard categories were used for the data tables. The category *Travel to Mexico (Nonresident Visitors)* represents nonresident visitors to Mexico, excluding residents of the United States and Canada. The category *Travel from Mexico (Mexican Residents)* includes departures from Mexico by Mexican residents.

### **United States**

U.S. Department of Commerce. International Trade Administration. Tourism Industries Office. *Summary of International Travelers to the U.S. and 1996 Outbound Travel*. (Washington, DC: 1997).

*Travel to the United States:* Travel to the United States represents travel by visitors who are not U.S. residents. Nonresident visitor data are based on international arrivals by air to the United States. These data are collected by the Immigration and Naturalization Service (INS) on form I-94. Canadian and Mexican residents are excluded from the data in Table 10-1 for nonresident visitors traveling by air to the United States. The INS data system makes it impossible to obtain data for other modes without including travel by Canadian and Mexican residents. The INS estimates that in 1996, 303,000 visitors (including residents of Canada and Mexico) came to the United States by water transportation. In 1995, visitors by water transportation were 269,000 and in 1990, 279,000.

*Travel from the United States:* Travel from the United States represents departures by U.S.

residents. U.S. resident departures data by air are primarily based on data collected by the Immigration and Naturalization Service (INS) on form I-92, supplemented by the *Survey of International Air Travelers*, which is conducted by the International Trade Administration (ITA) at the Department of Commerce. The I-92 is completed by air carriers, and provides data for the number of U.S. residents traveling abroad by air. The *Survey of International Air Travelers* provides data on the travel characteristics of U.S. residents traveling abroad by air. Figures for U.S. resident departures in Table 10-1 excludes U.S. residents who were departing to Canada and Mexico.

Data for travel from the United States in Table 10-1 are based on the number of resident departures by air, and not the number of country visits. In addition, the total number of air passengers (travel to and from the United States) in this table is based on a roundtrip and, therefore, differs from the total number of air passengers shown in Table 10-3, which is based on a one-way trip. In Table 10-1 U.S. residents traveling abroad are counted only once when they leave the country, and foreign residents are counted only once when they enter the country. In Table 10-3 U.S. residents are counted twice: once when leaving and once when returning. Similarly, foreign residents are counted twice: once when entering and once when leaving. Other differences between this table and Table 10-3 are due to the differing data sources. (Table 10-1 is based on immigration data, supplemented by an air travel survey. Table 10-3 is based on air carrier data.)

**Table 10-2**  
**Top International Origins and**  
**Destinations Outside of North**  
**America: 1996**

**All Countries**

Data in this table do not include international travel within North America. For Canada, the United States and Mexico are not included as destinations. For the United States, Mexico and Canada are not included as destinations. For Mexico, Canada and the United States are not included as destinations. In addition, destination country data for all three countries include visits by their residents to one or more countries outside North America.

For countries of origin, Canadian data exclude residents of Canada, the United States and Mexico, even if the travel of a Canadian, U.S. or Mexican resident originated in a third country, such as the United Kingdom. Similarly, for countries of origin, U.S. data exclude residents of the United States, Canada and Mexico, even if the travel of a U.S., Canadian or Mexican resident originated in a third country, such as the United Kingdom. Mexican data for regions of origin exclude residents of Canada, the United States and Mexico.

**Canada**

Statistics Canada. *International Travel, Travel between Canada and other countries (Touriscope), Catalogue 66-201-XPB*. (Ottawa, Ont.: various years).

Statistics Canada. Special tabulations. (Ottawa, Ont.: 1998).

Also see technical notes for Table 9-1a.

*Country of origin:* Canada Customs counts nonresident travelers upon their entry into Canada. A selected sample of these nonresi-

dents receive a travel questionnaire that ask a number of selected questions pertaining to the type of trip taken (travel characteristics). One such characteristic is the residency of the respondent and the length of stay while in Canada. Country of origin data in this table are based on visits to Canada of one or more nights. Canadian data in Table 10-2 exclude residents of the United States and Mexico, even if the travel of a U.S. or Mexican resident originated in a third country, such as the United Kingdom.

*Destination country:* Destination country data reflect the reported places visited by Canadian residents while travelling to foreign destinations. Destination country visits are for at least one night. Canadian residents, upon there reentry to Canada, are sampled as to the travel characteristics of the trip just completed. Among the many travel characteristics asked of the Canadian traveler are what countries were visited and how much time was spent in each.

**Mexico**

Banco de México. Dirección General de Investigación Económica. Dirección de Medición Económica. (Mexico City, D.F.: 1999). Information on the travelers country of origin and destination is not available because it is not processed. Therefore, data have been presented at the regional level. The region of origin or destination is based on the region furthest in distance from Mexico or the region where the traveler spent the most time.

**United States**

U.S. Department of Commerce. International Trade Administration. Tourism Industries Office. *Summary of International Travelers to the U.S. and 1996 Outbound Travel*. (Washington, DC: 1997).

*Country of Origin:* Origin country data represent the residency of international arrivals based on data collected by the Immigration and Naturalization Service (INS) on form I-94. The I-94 is a requirement of all international visitors to the United States with the exception of Canadians visiting the United States for less than 6 months and Mexicans travelling within the 40-kilometer border frontier zone. U.S. country of origin data in Table 10-2 exclude residents of Canada and Mexico, even if the travel of a Canadian or Mexican resident originated in a third country, such as the United Kingdom. U.S. origin country data are based on country of residency. Hence, if a citizen of France, who is a permanent resident of Germany, travels to the United States from his home in Germany, he will be recorded as a person coming from Germany.

*Destination Country:* Destination countries are based on data collected by the Immigration and Naturalization Service (INS) on form I-92, supplemented by the *Survey of International Air Travelers*, which is conducted by the International Trade Administration (ITA) at the Department of Commerce. The I-92 is completed by air carriers, and provides data for the number of U.S. residents traveling abroad by air. The *Survey of International Air Travelers* provides data on the travel characteristics of U.S. residents traveling abroad by air.

It should be noted that destination country data for the United States include *visits* by U.S. residents to one or more countries. For example, if a U.S. resident departed and flew first to the United Kingdom for 3 days, then went to France for another 7 days, and then returned to the United States, this person's travel would be counted twice, in terms of destination countries: once with a visit to the

United Kingdom and once with a visit to France. This methodology differs from the approach to calculate the overall number of U.S. international passengers (nonresident visitors plus resident departures) in Table 10-1 because Table 10-1 is based on the number of air travelers, and not the number of country visits, which is the basis of Table 10-2.

The Bureau of Transportation Statistics' 1995 American Travel Survey (ATS) also provides data on the amount of international overseas travel by U.S. residents. Data from this survey provide generally lower estimates of the amount of overseas travel by U.S. residents as well as a somewhat different ranking of destination countries. Part of the difference in the top ATS destination countries versus the top destination countries according to the *Survey of International Air Travelers* is that the ATS is based on overseas travel by all modes of transportation. The top ten ATS destinations (excluding Canada and Mexico) were, in thousands of visitors: United Kingdom (1,846), Bahamas (1,581), Jamaica (971), France (944), Italy (833), Germany (823), Japan (608), India (508) Bermuda (487) and Aruba (416).

**Table 10-3**  
**Top International Air Gateways,**  
**Excluding North American Travel: 1996**

**Mexico**

Aeropuertos y Servicios Auxiliares. *Resultado del Movimiento Aeroportuario. Enero-Diciembre, 1996.* (Mexico City, D.F.: 1997).

Data for this table are based on airline reports provided to the Aeropuertos y Servicios Auxiliares, which is the agency responsible for overseeing Mexico's major airports. One

of the most important uses of this information is to plan services at airports for both airlines and air passengers.

Data in this table differ from those in Table 10-1, because they are based on air carrier data reported to the Aeropuertos y Servicios Auxiliares. In contrast, the data in Table 10-1 are survey data collected as part of the Banco de Mexico's tourism and travel program. For more information on this program see the notes for Table 9-1a and 9-1c.

**United States**

U.S. Department of Transportation. Bureau of Transportation Statistics. Office of Airline Information. *T-100 Database*. (Washington, DC: 1998).

These data are based on regulatory air carrier data and represent the total passengers (both outbound and inbound traffic in flight segments) in scheduled and nonscheduled service of all U.S. and non-U.S. airlines to and from all international cities (other than Canadian and Mexican cities). This data source is different from the data source used for Table 10-1 that shows the number of international passengers by air (a sum of nonresident visitors and resident departures). Table 10-1 is based on immigration data, supplemented by an air travel survey. Table 10-3 is based on air carrier data and the number of passengers (regardless of country of residency).

In addition, data for international air travel differ between Table 10-1 and Table 10-3 because the total number of air passengers with international origins and destinations in this table is based on a round-trip and, therefore, differs from the number of air passengers (a sum of nonresident visitors and resident departures) shown in Table 10-1, which is based on a one-way trip. Because Table

10-3 is based on air carrier data, a traveler is counted twice: once when leaving and once when returning. In Table 10-1, however, the U.S. traveler is counted only once when she leaves the country, and a foreign (nonresident) traveler is counted only once when he enters the country.

In Table 10-3, New York consists of three airports (John F. Kennedy International (16.3 million international passengers), Newark (3.7 million) and La Guardia (0.2 million)). Washington, DC consists of 2 airports (Dulles International (2.5 million) and National (0.02 million)). Data for Guam were not included in this table, but if they were, Guam would rank number 7 with 2.97 million international passengers.

**SECTION 11: TRANSPORTATION INFRASTRUCTURE**

**Table 11-1**  
**Domestic Physical System Extent**

**All Countries**

For road, the overall total for Canada and the United States includes all roads (highways, local and others). However, the road total for Mexico does not include local roads. For the road subcategories, Canada cannot disaggregate its data for local roads into paved and unpaved. The rail data represent the length of track, including yard tracks, sidings and parallel lines. The transit rail data refer to one-way, fixed guideways.

**Canada**

Table 11-1 is based on the following primary sources:

Road: Transportation Association of Canada. *Transportation in Canada: A Statistical Overview—1995*. (Ottawa, Ont.: 1998).

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Great Lakes and inland waterways: Transport Canada. *Marine Distance Library*, 1997. (Ottawa, Ont.: 1998).

Pipeline: Statistics Canada. *Oil Pipeline Transport, Catalogue 55-201-XPB and Gas Utilities, Transport and Distribution Systems, Catalogue 57-205-XPB*. (Ottawa, Ont.: various years).

Rail: Statistics Canada. *Rail in Canada, Catalogue 52-216-XPB*. (Ottawa, Ont.: various years).

Road: It is not possible to present data according to the subcategories of major roads and local roads, which are included in Table 11-1. However, an overall total number as well as an overall number for paved and unpaved roads is available. For these figures, road length is based on a concept of a “two lane equivalent,” where a “two-lane equivalent” is a length of road measured as if there were only two lanes. For example, in this table, a 1-kilometer stretch of road with two regular lanes and one passing lane down the middle counts as 1.5 kilometers. Data for 1996 do not exist because the source of this data for 1990 and 1995 in Table 11-1 was a report entitled *Transportation in Canada: A Statistical Overview*, prepared for the Transportation Association of Canada (TAC), under contract. This particular report followed two earlier TAC publications: *Highways in Canada*, last published in 1991 and *Transportation in Canada*, last published in 1993. It is not known when a subsequent edition of *Transportation in Canada; A Statistical Overview*, will be issued or whether a subsequent edition will contain road extent data beyond year 1995.

The public road network in Canada extends slightly more than 900,000 kilometers. Approximately 35 percent of the network is paved, 57 percent has a gravel surface (in-

cluding “surface treatment”) and only 8 percent remains unsurfaced (such as dirt and winter roads. Winter roads are roads that are built in the winter over frozen lakes, rivers and muskeg). The Canadian National Highway System (NHS) consists of 24,449 route-kilometers of roads linking major cities, major international border crossings and ports. Although it comprises less than 3 percent of the Canadian road network, the Canadian National Highway System supports the bulk of both the interprovincial and international trade in goods and inter city passenger travel.

Great Lakes and inland waterways: Distances for the Great Lakes and inland waterways were calculated with use of an automated marine distance library developed by the Economic Analysis Directorate of Transport Canada. The total distance of Canada’s inland Waterways (2,825 kilometers) includes that distance along the St. Lawrence River from the Ontario-Québec border, along Québec’s north shore to the meridian of latitude 63° West (a distance of 1,029 kilometers) and the distance in U.S. waters in the Great Lakes system (1,796 kilometers).

The Great Lakes Region consists of those Canadian ports that are located along the St. Lawrence River west of the Ontario-Québec border, and on the four Great Lakes, which include Lake Ontario, Lake Erie, Lake Huron and Lake Superior. Canada’s Inland Waterways Region consists of all rivers, lakes and other navigable fresh waters within Canada including the St. Lawrence River as far seaward as a straight line drawn from Cap-des-Rosier to West Point, Anticosti Island, and from Anticosti Island to the north shore of the St. Lawrence River along the meridian of longitude 63° West. This area excludes the Mackenzie River and its tributaries, but includes time spent in U.S. waters of the St.



Lawrence River and the Great Lakes, where the St. Lawrence River Region consists of Canadian ports located on the St. Lawrence River from the Ontario-Québec border eastward, along the north shore to 63° West.

*Pipeline:* Natural gas pipeline data include pipeline used for the gathering, transmission and distribution of natural gas, but exclude gathering lines for the upstream producing industry. The length of natural gas pipeline also excludes pipeline used for the residential distribution of natural gas. Crude oil pipeline data include pipelines used for gathering, trunk-crude and product lines, but exclude upstream producers' gathering lines.

*Rail:* Data include freight and intercity passenger rail only. Rail track length for 1990 and 1995 includes rail lines owned or operated under lease, contract, trackage rights, or jointly owned and includes mainline, branch line and yard trackage. Data for 1995 indicate the length of track operated as of December 31, 1994.

### **Mexico**

*Road:* Secretaría de Comunicaciones y Transportes. Dirección General de Evaluación. *Longitud de la Infraestructura Carretera, 1990, 1995 y 1996.* (Mexico City, D.F.: various years).

*Pipeline:* Instituto Nacional de Estadística, Geografía e Informática, based on data from the Petróleos Mexicanos. Subdirección de Planeación and the *Anuario Estadístico* (various years). (Aguascalientes, Ags.: various years).

*Rail:* Ferrocarriles Nacionales de México. *Series Estadísticas 1990, 1995 y 1996.* (Mexico City, D.F.: various years).

*Transit:* Instituto Nacional de Estadística,

Geografía e Informática, based on data collected by the Sistema de Transporte Colectivo and the Sistema de Transporte Eléctrico in Mexico City, the Sistema de Transporte Colectivo de la Zona Metropolitana in Guadalajara, and the Sistema de Transporte Colectivo in Monterrey. (Mexico City, D.F.: various years).

*Road:* The total length of the national road network includes toll and nontoll roads as well as feeder rural roads. Local roads within municipal areas are not included.

*Rail:* The total length of rail under operation, including main, secondary and private railroads.

*Transit:* Data include the Sistema de Transporte Colectivo, Mexico City's tramway and Guadalajara's and Monterrey's electric trains (Metrorrey).

### **United States**

Table 11-1 is based on the following primary sources:

*Road:* U.S. Department of Transportation. Federal Highway Administration (FHWA). Special tabulation. (Washington, DC: 1998).

*Great Lakes and inland waterways:* U.S. Army Corps of Engineers. Navigation Data Center. Special tabulation. (New Orleans, LA: 1998).

*Gas pipeline:* American Gas Association. *Gas Facts.* (Arlington, VA: 1997). Table 5-1 and similar tables in earlier editions.

*Oil pipeline:* Eno Transportation Foundation, Inc. *Transportation in America.* (Lansdowne, VA: 1997). Page 64.

*Freight rail:* Association of American Railroads. *Railroad Facts.* (Washington, DC: 1997). Page 44.

Intercity passenger rail: National Railroad Passenger Corp. *Amtrak Annual Report 1996*. (Washington, DC: 1996). Statistical Abstract.

Transit rail: American Public Transit Association. *Transit Fact book 1996*. (Washington, DC: 1996).

Road: Road data for “major roads” include U.S. Interstate and arterials. Data for local roads include both collectors and local roads. Data for 1990 and 1995 do not include Puerto Rico, but data for 1996 do include Puerto Rico in all road categories.

Great Lakes and inland waterways: Data represent an estimated length of the U.S. Great Lakes and inland waterways on which commercial traffic was reported to the U.S. Army Corps of Engineers. Great Lakes data refer to domestic commercial traffic between U.S. Great Lakes ports. Inland waterways are defined as those geographically located within the boundaries of the contiguous 48 states or within the boundaries of the State of Alaska.

Pipeline: Gas pipeline data include transmission pipelines, distribution, main and field gathering lines, but exclude service pipes. Gas pipeline data are not adjusted to common diameter equivalent, and data are reported at the end of each year. Oil pipeline data include petroleum and other liquid product lines, including gathering lines.

Rail: Rail data include length of track owned, including yard tracks, sidings and parallel lines by the National Railroad Passenger Corporation (Amtrak) and Class I freight railroads. Class I railroads have annual gross operating revenues in approximate excess of \$250 million (based on 1991 dollars) and comprise only 2 percent of the railroads in the U.S., but account for about 70 percent of

the industry’s distance operated (73 percent in 1996), 90 percent of its employees and 90 percent of its freight revenues. Portions of the freight, intercity passenger and commuter rail networks share common trackage in the United States. Jointly used rail track is only counted once in U.S. statistics.

Transit rail: Transit rail data include commuter rail, heavy rail and light rail. Data are one-way, fixed guideway.

## **Table 11-2**

### **Number of Airports**

For all countries, data in Table 11-2 *do not* include heliports, stolports (an airport specifically designed for short take-off and landing aircraft, separate from conventional airport facilities) and seaplane bases.

### **Canada**

Table 11-2 is based on the following primary sources:

All data, except percent of control towers: Natural Resources Canada. *Canada Flight Supplement*. (Ottawa, Ont.: 1998). Airport facilities information provided to Natural Resources Canada for publication in *Canada Flight Supplement* by NAV CANADA. 1998.

Percent with control towers: Transport Canada. *Aircraft Movement Statistics, TP577*. (Ottawa, Ont.: 1998).

The number of Canadian heliports is excluded from the data in Table 11-2. In 1990 there were 314 heliports; in 1995 and 1996, there were 313. Of these heliports, there were 204 (1990), 210 (1995) and 211 (1996) heliports that were either certified and/or operated by the Canadian Department of National Defense.

In Canada, an aerodrome is a generic name for facilities that are registered with Trans-

port Canada as aircraft landing and take-off sites. Aerodromes are identified and described in *Canada Flight Supplement*, a publication produced on a monthly basis, under the authority of Nav Canada and Canada's Chief of Defense Staff, by Geometrica Canada, Department of Natural Resources. Most of Canada's commercial aviation activity takes place at certified airports. Some aerodromes are privately owned but the majority of the certified airports in Canada are owned by municipalities, provincial/territorial governments, or the federal government.

### Mexico

Secretaría de Comunicaciones y Transportes. Dirección General de Aeronáutica Civil. (Mexico City, D.F.: 1997).

*Certified airports:* Data represent those airports managed by Aeropuertos y Servicios Auxiliares, the Secretaría de Comunicaciones y Transportes, the Secretaría de la Defensa Nacional (Ministry of National Defense), the Secretaría de Marina (Ministry of the Navy), and state and municipal governments.

### United States

Table 11-2c is based on the following primary sources:

U.S. Department of Transportation. Federal Aviation Administration. *Statistical Handbook of Aviation 1996*. (Washington DC: 1997). Web site: [api.hq.faa.gov/handbook/1996/toc96.htm](http://api.hq.faa.gov/handbook/1996/toc96.htm)

U.S. Department of Transportation. Federal Aviation Administration. *Administrator's Fact Book*. (Washington, DC: December 1993 and August 1998).

U.S. Department of Transportation. Federal Aviation Administration. Private Communication. (Washington, DC: 1998).

*Total airports:* Data for the number of total airports in Table 11-2 include only civilian

and joint-use civilian-military airports in the United States and its territories. Purely military airports are excluded. These data *do not* include heliports, stolports (an airport specifically designed for short take-off and landing aircraft, separate from conventional airport facilities) and seaplane bases. If data for heliports, stolports and seaplane bases were added to the number of civilian and joint-use airports, the total would be: 1990: 17,490; 1995: 18,224; and 1996: 18,292.

*Certified airports:* Data for certified airports are based on those airports that serve air carrier operations with aircraft seating more than 30 passengers. In 1990, there were 680 certified civilian, joint-use civilian-military and military airports. A breakout of civilian and joint-use certified airports versus purely military certified airports is not available for earlier than 1994. In 1994 and 1995, there were 95 purely military certified airports and in 1996, there were 94 purely military certified airports.

*Data sources:* The data are based on information collected by the FAA Office of Airport Safety and Standards "through physical inspections and mail solicitations, and reported on the *Airport Master Record* (Form FAA 5010-1) and the *FAA Landing Facilities Information Request on Airports, Heliports, Stolports, and Seaplane Bases* (Forms FAA 5010-2 and 5010-5)." For additional definitions and more information on U.S. airports, see chapter three of the *FAA Statistical Handbook of Aviation*.

### Tables 11-2a, b and c Top Airports by Flight Operations: 1996

Canadian and U.S. data in Tables 11-2a and 11-2c report the total number of *civilian itinerant operations* of commercial air carriers

and general aviation. Military operations and local operations have been excluded. Definitions of local and itinerant operations are as follows:

*Local:* Local operations are performed by aircraft that:

- (1) Operate in the local traffic pattern or within sight of the airport
- (2) Are known to be departing for, or arriving from, flight in local practice areas located within a 20-mile (32-kilometer) radius of the airport
- (3) Execute simulated instrument approaches or low passes at the airport.

*Itinerant:* Itinerant operations are all aircraft operations other than local operations. Mexican data in Table 11-2 b report the total number of civilian local *and* itinerant operations of commercial air carriers and general aviation. This differs from U.S. and Canadian data in Tables 11-2a and 11-2c where local operations have been excluded. However, the above definitions of local and itinerant still apply.

**Table 11-2a**

**Top 20 Canadian Airports by Flight Operations: 1996**

**Canada**

Table 11-2a is based on the following primary sources:

Flight operations: Transport Canada. *Aircraft Movement Statistics, TP 577*. (Ottawa, Ont.: 1998).

Airport characteristics: Natural Resources Canada. *Canada Flight Supplement*. (Ottawa, Ont.: 1998) Airport facilities information provided to Natural Resources Canada for

publication in *Canada Flight Supplement* by NAV CANADA. 1998.

**Table 11-2b**

**Top 20 Mexican Airports by Flight Operations: 1996**

**Mexico**

Aeropuertos y Servicios Auxiliares. *Resultado del Movimiento Aeroportuario, Enero-Diciembre de 1996*. (Mexico City, D.F.: 1997).

The number of flight operations includes scheduled and nonscheduled commercial aviation and general aviation at airports managed by the Aeropuertos y Servicios Auxiliares.

**Table 11-2c**

**Top 20 U.S. Airports by Flight Operations: 1996**

**United States**

This table is based on the following primary sources:

U.S. Department of Transportation. Federal Aviation Administration. *Statistical Handbook of Aviation-1996*. (Washington DC: 1997). Web site: [api.hq.faa.gov/handbook/1996/toc96.htm](http://api.hq.faa.gov/handbook/1996/toc96.htm)

Flight operations: U.S. Department of Transportation. Federal Aviation Administration. Office of Aviation Policy and Plans. Information Systems Branch. Private Communication. (Washington, DC: 1998).

Airport characteristics: U.S. Department of Transportation. Federal Aviation Administration. Office of Airport Safety and Standards. Airport Safety and Operations Division, based on FAA Airport Master Record, Form FAA 5010. Special tabulation. (Washington, DC: 1998).

See also the G.C.R. & Associates, Inc. web site: [www.gcr1.com/](http://www.gcr1.com/) (Click on Links and then on FAA 5010 Database.)

The data on number of flight operations (i.e., number of takeoffs plus number of landings) are reported to the FAA by the airport traffic control towers. The FAA *Statistical Handbook of Aviation* reports itinerant plus local operations. However, for this table, the FAA supplied an unpublished list showing total civilian *itinerant* operations. The FAA *Statistical Handbook of Aviation* also reports a great deal of information on the U.S. airspace system, including the top 50 airports (technically, the top 50 FAA-Operated Airport Traffic Control Towers) ranked in order of total operations, with the data broken out by aviation category (air carrier, air taxi, general aviation, military). Detailed data on activity at individual facilities can be found in the report, FAA *Air Traffic Activity*.

**Table 11-3**  
**Number of Water Ports and Facilities**

**Canada**

Statistics Canada. Transportation Division. Special tabulation. (Ottawa, Ont.: 1998).

*Total ports:* Data for the total number of ports in this table include marine ports or facilities reporting domestic and international cargo as reported on either Statistics Canada's *Domestic Shipping Report* or Revenue Canada's Customs Declarations. (See notes for Table 11-4a for a description of statistical instruments used by Statistics Canada to report domestic and international cargoes that are handled by Canadian ports).

*Definitions of regions:* The Atlantic region consists of Canadian ports on the Atlantic Ocean and Arctic Waters, and that portion of the Gulf of St. Lawrence that is east of the inland waters as defined in the Canadian Shipping Act. Data for Canadian Atlantic ports in this table include ports in Canadian Arctic waters and facilities that are located at Hibernia and Sable Island (off-shore drilling sites). The Pacific region consists of Canadian ports located on the Pacific Coast. The Great Lakes Region consists of Canadian ports located along the St. Lawrence River west of the Ontario-Québec border, and on the Great Lakes. Data for Canadian inland ports in this table include ports located on the St. Lawrence River and the Mackenzie Delta. (The St. Lawrence River Region consists of Canadian ports located on the St. Lawrence River from the Ontario-Québec border eastward, along the north shore to 63° west longitude and along the south shore to Cap-des-Rosiers.)

**Mexico**

Secretaría de Comunicaciones y Transportes. Coordinación General de Puertos y Marina Mercante. *Los Puertos Mexicanos en Cifras 1990-1996*. (Mexico City, D.F.: 1997).

The number of ports includes the oil facilities located in Cayo Arcas, in front of the coast of the state of Campeche.

**United States**

U.S. Army Corps of Engineers. Navigation Data Center. Special tabulation. (New Orleans, LA: 1998).

The number of U.S. ports for a particular year represents any U.S. port with annual activity of greater than one U.S. short ton, either do-

mestic or foreign. The only facility included in this count of ports and facilities is the Louisiana Offshore Oil Platform (LOOP). The category *Caribbean* includes ports in Puerto Rico and the U.S. Virgin Islands.

**Table 11-4a**  
**Top 20 Canadian Water Ports by Tonnage (Domestic and International): 1996**

**Canada**

Statistics Canada. *Shipping in Canada, Catalogue 54-205-XPB, 1996*. (Ottawa, Ont.: 1998).

Statistics Canada. Transportation Division. Special tabulations. (Ottawa, Ont.: 1998).

*Domestic tonnage:* Information on domestic shipping is collected from the *S.1 Domestic Shipping Report* and the *S.4 Towboat and Ferry Operators Shipping Report*. The S.4 report is used on Canada's west coast only. A record of activity is filed with Statistics Canada for each vessel entering or leaving a Canadian port in domestic shipping, with the exception of: cargo vessels under 15 net registered tons; tugs or other vessels under 15 gross register tons; Canadian naval or fishing vessels; research vessels; and ballast movements for towboat and ferry operators on the West Coast that are reporting on S.4 reports.

*International tonnage:* International commodity statistics are compiled from data collected on the A6 General Declaration and supporting cargo reports supplied to Statistics Canada by Revenue Canada, Customs and Excise, or equivalent reports from shipping lines and port authorities. Coverage extends to all vessels entering or leaving Canadian ports while engaged in international shipping with the exception of: fishing vessels of both

Canadian or foreign registry for which there is no foreign port reported on the A6 report; maintenance and service vessels such as ice-breakers; research vessels; and, other non-commercial vessels such as hospital ships. Data include intransit shipments.

*Containerized shipments/entrances and clearances:* The metric tonnage of total international and domestic containerized freight in 1996 was 17,911,000 metric tons. The total number of entrances and clearances of ships at all Canadian ports in 1996 was 93,170 ships.

**Table 11-4b**  
**Top 20 Mexican Water Ports by Tonnage (Domestic and International): 1996**

**Mexico**

Secretaría de Comunicaciones y Transportes. Coordinación General de Puertos y Marina Mercante. *Los Puertos Mexicanos en Cifras 1990-1996*. (Mexico City, D.F.: 1997).

Containerized cargo does not include the containers, only their contents. Data include in-transit shipments.

**Table 11-4c**  
**Top 20 U.S. Water Ports by Tonnage (Domestic and International): 1996**

**United States**

Tonnage: U.S. Army Corps of Engineers. *Waterborne Commerce of the United States, National Summaries, Part 5*. (New Orleans, LA: 1996).

Percent of containerized shipments: U.S. Army Corps of Engineers. Navigation Data Center. Special tabulation. (New Orleans, LA: 1998).

*Domestic tonnage:* Domestic tonnage data by port are based on domestic waterborne traffic movements that are reported to the U.S. Army Corps of Engineers (USACE) by all vessel operators of record. In summarizing domestic commerce, certain movements are excluded: cargo carried on general ferries; coal and petroleum products loaded from shore facilities directly into bunkers of vessels for fuel, and insignificant amounts of government materials moved on government owned equipment in support of USACE projects. Domestic tonnage data are based on the traffic of the contiguous and noncontiguous U.S. states and territories constituting the geographical space upon which domestic commerce may be transported. This includes Hawaii, Alaska, the 48 contiguous states, Puerto Rico and the Virgin Islands, Guam, American Samoa, Wake Island and U.S. Trust Territories. The subtotal for domestic tonnage of the top 20 ports represents the total tons moving in and out of the top 20 ports, excluding duplications. (For example, tonnage moving between Houston, TX and Corpus Christi, TX is counted only once in the subtotal for domestic tonnage of the top 20 ports.)

*International tonnage:* International tonnage data by port are primarily based on data for official U.S. international waterborne merchandise trade. This data include international merchandise imports to and exports from the United States that moved by water modes of transportation. In this table and in data reported by the U.S. Army Corps of Engineers, these data are supplemented by intransit shipments to provide port figures for international tonnage. Intransit shipments are shipments moving from one non-U.S. country to another non-U.S. country via a port or facility in the United States. Intransit shipments are not considered part of official U.S. international merchandise trade, but

these shipments do utilize and impact U.S. port infrastructure.

*Containerized shipments/entrances and clearances:* Data for containerized shipments are based on international containerized shipments plus domestic containerized shipments. Domestic containerized shipments are estimated based upon the vessel type and/or the vessel operating company moving the cargo. Commercial vessel movement into and out of water ports excludes fishing vessels. Data represent both loaded and unloaded vessels.

**Table 11-5**  
**Toll Roads, Bridges and Tunnels**

**Canada**

Table 11-5 is based on the following primary source:

Transport Canada. Highway Policy Group. Special tabulation. (Ottawa, Ont.: 1998).

Data in this table include 11 international bridges and 1 international tunnel on the U.S. Canadian border.

**Mexico**

Secretaría de Comunicaciones y Transportes. Dirección General de Evaluación. *Longitud de la Infraestructura Carretera, 1990, 1995 and 1996.* (Mexico City, D.F.: various years).

Data comprise the private sector (concessionaires), federal and state governments.

**United States**

U.S. Department of Transportation. Federal Highway Administration. *Toll Facilities in the United States: Bridges, Roads, Tunnels, Ferries.* (Washington, DC: various years).

Data are based on a survey of facilities (in operation, financed, or under construction)

conducted by the Federal Highway Administration in cooperation with state highway agencies. Data include Puerto Rico. Data are for January 1 of the reference year. Toll roads excludes the length of roadway on toll bridges/tunnels and parts of toll roads that are used toll free by local residents. Toll bridge facilities made up of more than one bridge are counted only once. Toll tunnel facilities made up of more than one tube are counted only once.

## SECTION 12: TRANSPORTATION VEHICLES

**Table 12-1**  
**Number of Transportation Vehicles/  
Equipment**

### All Countries

Data for the number of road motor vehicles are approached differently in each of the three countries. At the overall level, the data are comparable. However, for the specific road subcategories, there are some definitional differences between Canada, Mexico and the United States, especially in terms of light trucks. Light trucks include vehicles such as sports utility vehicles, vans, pick-up trucks, mini-vans and jeeps. In Canada, light trucks are included in the overall total for the number of road motor vehicles, but light trucks are not included in the Canadian data for personal vehicles or in the data for commercial freight vehicles. In the United States, light trucks are included within personal vehicles and can be differentiated from passenger cars. Therefore the U.S. and Canadian data for the number of personal vehicles are not exactly comparable. Mexico has included light trucks in both its overall total for road motor vehicles as well as in its total for personal vehicles, although light trucks cannot be differentiated from passenger cars. Light trucks

used for business purposes are included in Mexico's total for commercial freight vehicles, while those used for personal reasons are included in Mexico's total for personal vehicles.

### Canada

Table 12-1 is based on the following primary sources:

Air: International Civil Aviation Organization. *Civil Aircraft on Register. Digest of Statistics No. 437.* (Montréal, Que.: 1998).

Passenger cars, motorcycles, school buses: Statistics Canada. *Road Motor Vehicles, Registrations, Catalogue 53-219-XPB, 1997.* (Ottawa, Ont.: various years).

Charter, intercity and local motor buses: Statistics Canada. *Passenger Bus and Urban Transit Statistics, Catalogue 53-215-XPB.* (Ottawa, Ont.: various years).

Commercial freight vehicles: Statistics Canada. *Trucking in Canada, Catalogue 53-222-XPB.* (Ottawa, Ont.: various years).

Rail: Statistics Canada. *Rail in Canada, Catalogue 52-216-XPB.* (Ottawa, Ont.: various years).

Transit: Statistics Canada. *Passenger Bus and Urban Transit, Catalogue 53-215-XPB.* (Ottawa, Ont.: various years).

Water transport: Lloyd's Register of Shipping. *Statistical Tables—1990 Table 2 and World Fleet Statistics—Tables 2,* Editions 1995 and 1996. (London, UK: various years).

Air: Aircraft data in this table are based on regulatory definitions established by the Transportation Safety Board of Canada. Commercial aircraft include the following types of Canadian registered aircraft used by Canadian air operators that offer a "for-hire" service to transport people or goods, or to



undertake specific tasks such as aerial photography, flight training and crop spraying: (1) airliner (2) commuter aircraft and (3) air taxi or specialty aircraft. For specific definitions of all of these commercial aircraft types, refer to the technical notes for Table 3-1. General aviation aircraft, as defined by the Transportation Safety Board of Canada, includes Canadian registered aircraft that are used by private operators, which include individuals flying for pleasure and companies flying for business reasons, or state operators, which include the federal and provincial governments. Canadian air data in Table 12-1 are from the International Civil Aviation Organization (ICAO) publication, *Aircraft Register*. This publication, *Aircraft Register*, inventories Canada's aircraft equipment by type (jet/nonjet) and use (air carrier/commercial operations or general aviation).

*Commercial aircraft:* In Table 12-1, commercial aircraft data include jets and nonjets. Jets include all commercial turbo-jet aircraft. Nonjets include all commercial propeller driven (turbine and piston) fixed wing type aircraft and all commercial rotary wing (turbine and piston) aircraft. Jet and nonjet Canadian commercial aircraft include Canadian registered aircraft that are used by Canadian air operators whose air operations are grouped by air carrier reporting levels I to VI (which includes a rating associated with the amount of revenue generated by their commercial air carrier operations).

*General aviation:* General aviation data include all noncommercial turbo-jet aircraft; all noncommercial propeller driven (turbine and piston) nonjet fixed wing type aircraft; and all noncommercial rotary wing (turbine and piston) aircraft.

*Road, total:* Under road data, overall totals include Canadian vehicle registrations recorded in the vehicle registration files of Canada's ten provinces and two territorial regions and compiled by Statistics Canada for its annual publication *Road Motor Vehicles—Registrations*. Vehicle type categories in Canada's registration files include: passenger automobiles (including taxis and for-hire cars); trucks and truck tractors; buses (separated between school buses and other); motorcycles; registered mopeds; and, "other road motor vehicles" (including vehicles such as ambulances, fire trucks etc.). These categories do not correspond directly with the vehicle type categories used in Table 12-1. Although the total includes all registered vehicles, the table categories of personal vehicles, buses and commercial freight vehicles are based on data that indicate *only a portion* of the total number of Canadian vehicle registrations.

*Road, personal vehicles (passenger cars, motorcycles and light trucks):* The total for personal vehicles represents only passenger automobiles and motorcycles. Passenger car data include registered passenger cars, taxis and for-hire cars. Motorcycle data include registered motorcycles and mopeds. Light trucks (such as mini-vans and pick-ups) are not a distinct category in Canada's vehicle registration files, but are included in the category of "trucks and truck tractors." Light trucks cannot be separated from the total number of "trucks and truck tractors" in Canada's vehicle registration files. Therefore, separate data for light trucks are nonexistent and *no* light trucks have been included in the total for personal vehicles.

*Road, commercial freight vehicles:* The data in this category are based on two sources;

provincial motor vehicle registration files and Statistics Canada's *Motor Carriers of Freight Survey*. In Canada's motor vehicle registration files, "commercial freight vehicles" is not a unique category. As a result, the total number of commercial freight vehicles, as well as the totals for the subcategories of single-unit trucks and tractors, are primarily derived from Statistics Canada's *Motor Carriers of Freight Survey*, supplemented with some data from vehicle registration files, as described below.

Data for single-unit trucks and tractors in Table 12-1 are based on data from Statistics Canada's *Motor Carriers of Freight Survey*. Data from this survey represent estimated numbers for single-unit trucks and tractors that are operated by owner operators and/or Canadian for-hire carriers (or trucking companies) that earn annual revenues greater than or equal to \$25,000 Canadian dollars.

Data for the total number of commercial freight vehicles are based on the data from the *Motor Carriers of Freight Survey* and on the supplementary vehicle registration data. The supplementary data from Canada's motor vehicle registration files represent "other motor vehicles," such as ambulances, fire trucks and specialized commercial motor vehicles. It should also be noted that the commercial freight vehicle data in Table 12-1 do not correspond to the "trucks and truck tractors" category in Canada's vehicle registration files. The "trucks and truck tractors" category in Canada's vehicle registration files includes smaller trucks, smaller truck tractors and light trucks (such as mini-vans and sports utility vehicles) and also includes trucks that are privately operated. These types of vehicles have been included *only* in the overall total for the number of road motor vehicles Table 12-1.

*Road, buses:* Buses include charter, intercity, local motor (or transit) and school buses. The overall bus total, as well as the number of school buses, is based on provincial and territorial vehicle registration files and reported in Statistics Canada's annual publication, *Road Motor Vehicles-Registrations*. Bus data for charter, intercity and local motor buses are based on a sample of Canadian companies engaged in scheduled intercity bus, urban transit, school bus and charter and other types of bus service (Statistics Canada's annual *Survey of the Passenger Bus and Urban Transit Industry*). Statistics Canada conducts this survey on a quarterly basis with an annual supplement. Prior to 1994, the survey program was restricted to those companies earning \$500,000 Canadian dollars or more. Beginning in 1994, the survey was expanded to include companies earning \$200,000 or more.

*Rail:* Rail data for freight cars include Canadian Class I and Class II railways. Freight locomotives include Class I and Class II railways and both freight and yard-type locomotives. Rail data for intercity passenger, train cars and locomotives include Class I (VIA Rail) and Class II railways.

*Transit:* Transit data are estimates of numbers of vehicles (revenue equipment operated), including rail transit vehicles and buses owned and leased, and are derived from a sample of Canadian companies engaged in urban transit bus service and used in Statistics Canada's annual *Survey of the Passenger Bus and Urban Transit Industry*. The total number of transit vehicles includes light rail transit vehicles, heavy rail transit vehicles, commuter rail vehicles and both "owned" and "leased" revenue motor bus vehicles operated for urban transit passenger service (i.e., standard motor bus, low floor

motor bus, trolley coach, articulated bus and other buses). Data for transit railcars include light rail vehicles, heavy rail vehicles and commuter rail vehicles.

*Water transport:* Lloyd's Register of Shipping has granted permission for use of their data on Canadian flag vessels for years 1990, 1995 and 1996. These data are published in Table 2 of Lloyd's Register, *Statistical Tables 1990* and in Tables 2A, 2B, 2C, 2D and 2E of Lloyd's Register, *World Fleet Statistics* (1996 and 1997 editions). The data on Canadian flag vessels that are published in the Lloyd's Registry are Canadian flag vessels, registered in Canada, in accordance with conditions identified in Sections 6, 7 and 8 of Part 1, *Canada Shipping Act* (Chapter S-9).

Other passenger vessels include passenger/ro-ro cargo and passenger/general cargo vessels. Tanker vessels include liquefied gas, chemical, oil, oil/chemical tankers and other liquid carriers. Dry bulk vessels include dry bulk, ore/bulk/oil carriers, ore/bulk carriers, self-discharging dry bulk, bulk and other dry bulk carriers. Specialized carrier vessels include specialized and refrigerated cargo carriers. General cargo includes general cargo, ro-ro cargo and other dry cargo vessels. Dry cargo/barge vessels include general cargo vessels and barges. Fishing vessels include fish catching, fishing (including factory ships) and other fishing vessels. Fishing vessels include fish catching, fishing (including factory ships) and other fishing vessels. However there is a considerable undercount of fishing vessels due to the exclusion of vessels under 15 gross registered tons. Offshore vessels include offshore supply and other offshore vessels. Other vessels include research, dredging and all other types of vessels.

## Mexico

*Air:* Secretaría de Comunicaciones y Transportes. Dirección General de Aeronáutica Civil. *La Aviación Mexicana en Cifras, 1990-1996*. (Mexico City, D.F.: 1997).

*Rail:* Ferrocarriles Nacionales de México. *Series Estadísticas, 1990, 1995 and 1996*. (Mexico City, D.F.: various years).

*Road:* Instituto Nacional de Estadística, Geografía e Informática based on data collected by the Departamento del Distrito Federal, Dirección General de Autotransporte Urbano, Direcciones de Policía y Tránsito Estatales y Municipales. (Mexico City, D.F.: various years).

*Transit:* Instituto Nacional de Estadística, Geografía e Informática. Dirección de Estadísticas Económicas, based on data collected by the Sistema de Transporte Colectivo y Eléctrico in Mexico City, the Sistema de Transporte Eléctrico de la Zona Metropolitana in Guadalajara and the Sistema de Transporte Colectivo in Monterrey. (Mexico City, D.F.: various years).

*Water:* Secretaría de Comunicaciones y Transportes. Coordinación General de Puertos y Marina Mercante. (Mexico City, D.F.: 1997).

*Air:* Commercial aircraft includes aircraft from scheduled, charter and freight airlines and air taxis. General aviation includes private and official aircraft. For 1990, 714 air taxis are included in the total for commercial aircraft. The corresponding numbers for 1995 and 1996 are 1,051 and 950, respectively. It is not possible to separate air taxis into jets and nonjets

*Road:* Road data come from the statistics of the *Motor Vehicles Registered Under Circulation*. The subcategory of personal vehicles is comprised of private cars, some light trucks, cabs and official vehicles. The subcategory of commercial freight vehicles represents medium and heavy trucks and also may include some light trucks. Data for intercity buses and commercial freight vehicles represent only vehicles that are permitted, by regulation, to use the federal highway system.

*Rail:* Only a total for locomotives can be reported because they are used interchangeably, and not specifically dedicated to passenger or to freight trains.

### United States

Table 12-1 is based on the following primary sources:

#### Commercial aircraft:

U.S. Department of Transportation. Federal Aviation Administration. *Administrator's Fact Book*. (Washington, DC: August 1998 and December 1996).

U.S. Department of Transportation. Federal Aviation Administration. *Statistical Handbook of Aviation-1996*. (Washington DC: 1997). Web site: [api.hq.faa.gov/handbook/1996/toc96.htm](http://api.hq.faa.gov/handbook/1996/toc96.htm)

General aviation: U.S. Department of Transportation. Federal Aviation Administration. *Statistical Handbook of Aviation-1996*. (Washington, DC: 1997). Tables 8.1, 8.2, 8.3. Web site: [api.hq.faa.gov/handbook/1996/toc96.htm](http://api.hq.faa.gov/handbook/1996/toc96.htm)

U.S. Department of Transportation. Federal Aviation Administration. *General Aviation and Air Taxi Activity Survey*. (Washington DC: April 1998). Tables 1.1 and 1.3. Web site: [api.hq.faa.gov/ga96/gatoc.htm](http://api.hq.faa.gov/ga96/gatoc.htm)

Road: U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, 1996*. (Washington, DC: 1997). Tables MV-1, 7, 9, 10 and 11.

Local motor bus: American Public Transit Association. *Transit Fact Book 1996*. (Washington, DC: 1996).

Transit rail: American Public Transit Association. *Transit Fact Book 1996*. (Washington, DC: 1996).

Freight rail: Association of American Railroads. *Railroad Facts*. (Washington, DC: 1997). Pages 48 and 50.

Intercity passenger rail: National Railroad Passenger Corp. *Amtrak Annual Report 1996*. (Washington, DC: 1996). Statistical Abstract.

#### Water transport:

Recreational and fishing boats: U.S. Department of Transportation. U.S. Coast Guard. Office of Marine Safety. *Merchant Vessels of the United States*. (Washington, DC: 1998).

All other vessels: U.S. Army Corps of Engineers. Navigation Data Center. *Waterborne Transportation Lines of the United States, Calendar Year 1996*. (New Orleans, LA: 1997).

*Air:* The total number of aircraft has been rounded to the nearest 100 because the standard deviation in the number of general aviation aircraft does not allow greater precision. (See discussion below.)

*Commercial aircraft:* Data for commercial aircraft in Table 12-1 include *all* aircraft that are reported as being in operation by U.S. air carriers and that carry passengers or cargo for hire, both scheduled and nonscheduled service. On-demand air taxis *are* included with commercial aircraft in Table 12-1, as reported in the FAA *Administrator's Fact Book*.

(Excluding on-demand air taxis, the commercial aircraft numbers are: 1990: 6,083; 1992: 7,320; 1995: 7,411; and 1996: 7,478. See Chapter 5 of the FAA *Statistical Handbook of Aviation* for more information on the U.S. air carrier fleet (including the jet/nonjet breakdown) when on-demand air taxis are excluded.) The commercial aircraft data in Table 12-1 were developed from reports collected by the FAA from the carriers; that is, the data are a *total count* of the aircraft reported to the FAA as being *used* in air carrier service. (Note that this is different from an inventory of aircraft *owned* by the air carriers.) The FAA keeps this data in its Vital Information System (VIS).

*General aviation:* General aviation data are based on a FAA mail survey, the *General Aviation and Air Taxi Activity (and Avionics Survey)* (hereafter referred to as *Survey*). This survey uses a scientifically designed random sample that represents all general aviation aircraft and on-demand air taxis registered in the United States. The *Survey* data include only aircraft in active use. The general aviation data in Table 12-1 exclude on-demand air-taxis because they have been included with commercial aircraft, as explained above. Because the general aviation data are derived from a sample, there is sampling error. Thus, in some of its tables, the FAA rounds the totals to the nearest 100. The standard deviation on the *Survey's* totals for general aviation aircraft plus on-demand air taxis is, however, considerably larger than 100. Standard deviations are given explicitly in the FAA *Statistical Handbook of Aviation*, chapter 8 and in the *Survey* itself.

As stated above, Table 12-1 combines on-demand air taxis and air carrier aircraft into the category commercial aircraft. Thus, to derive the numbers for general aviation in

Table 12-1, the *Survey's* data for on-demand air taxis have been subtracted from the *Survey's* totals for general aviation aircraft plus on-demand air taxis. (It is important to note that the *Survey* underestimates on-demand air taxis, and the *Survey's* numbers for on-demand air taxis do not agree with the on-demand air taxi data in the FAA's Vital Information System.) If numbers for on-demand air taxis from the *Survey* are *included* in the total for general aviation aircraft, the totals are, 1990: 196,800; 1992: 185,700; 1995: 182,600; and 1996: 187,300. These are the same totals that are reported for the number of general aviation aircraft plus on-demand air taxis in chapter eight of the FAA *Statistical Handbook of Aviation* and chapter one of the *Survey*.

*Road:* Road data are based on statistics compiled by the Federal Highway Administration (FHWA) at the U.S. Department of Transportation from reports submitted by the states. In 1995, FHWA revised the data series for the number of U.S. road vehicles. The new categories include passenger car, light trucks ("other 2-axle, 4-tire vehicles"), "single-unit 2-axle 6-tire or more truck" and combination truck tractors. Pre-1993 data were assigned to the closest available category. Data for light trucks or "other 2-axle, 4-tire vehicles" include vans, pick-up trucks and sport/utility vehicles. "Single-unit 2-axle 6-tire or more trucks" are on a single frame with at least two axles and six tires, and correspond to the category of single-unit trucks in Table 12-1. Combination truck tractors correspond to the category of tractors in Table 12-1. Passenger cars include taxis. The total for buses is based on FHWA estimates and include intercity, charter, school and local motor bus. The estimate of local motor buses is based on data from the American Public

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Transit Association (APTA) (see transit section for a description). All road data represent registered vehicles in the U.S., except local motor buses that are active passenger vehicles.

*Rail:* Rail data for rail freight include in-service freight cars and locomotives belonging to Class I railroads and car companies and freight shippers. Class I railroads have annual gross operating revenues in approximate excess of \$250 million (based on 1991 dollars) and comprise only 2 percent of the railroads in the U.S., but account for about 70 percent of the industry's distance operated, 90 percent of its employees and 90 percent of its freight revenues. Data for intercity passenger rail only include in-service intercity cars and locomotives. Of the total number of freight railcars in Table 12-1, a large share belong to shippers and railcar companies. In 1990, 658,902 freight cars belonged to shippers and rail car companies. In 1995 and 1996, the corresponding numbers were 583,486 and 570,865, respectively.

*Transit:* Transit data are from the American Public Transit Association (APTA) and are based on information in the Federal Transit Administration's (FTA) National Transit Database. APTA conservatively adjusts the FTA data to include transit operators that do not report to this database. These nonreporting operators typically include private, very small and/or rural operators. There are about 6,000 transit operators in the U.S., according to APTA. Only about 1,000 of these report to FTA. However, these 1,000 operators account for approximately 90 to 95 percent of the total transit passenger-kilometers. Reliability of the U.S. transit data varies by mode. The numbers for rail are the most comprehensive; those for bus are less so because there are so many more operators. Transit total includes other U.S. transit

categories not individually specified here, including local motor bus, ferries, and transit for the disabled. Transit railcars includes light railcars, heavy railcars and commuter rail cars and locomotives.

*Water transport:* Water data for all vessels, except other passenger vessels, recreational boats and fishing vessels, are based on U.S. Army Corps of Engineers (USACE) data. USACE data are derived from an annual survey of vessels available for operation in domestic waterborne trade as of December 31 of the respective year. USACE vessel data have been organized in this table according to the International Classification of Ship Type (ICST) system. The ICST category for "miscellaneous types, other" includes research vessels or dredges. Because the USACE data represent vessels engaged in waterborne commerce, research vessels and dredges, are excluded from USACE data. Therefore, the United States cannot provide data for this ICST category. USACE data also represent U.S. flagged vessels. A U.S. flagged vessel is one that is U.S. operated, but not necessarily U.S. owned.

Data on passenger vessels, recreational boats and fishing vessels are from the U.S. Coast Guard's (USCG) *Merchant Vessels of the United States* publication. Under USCG definitions a recreational boat is one used for pleasure purposes with a weight greater than 5 deadweight tons. The USCG defines fishing vessels as those that "commercially engage in the catching, taking, or harvesting of fish or an activity that can reasonably be expected to result in the catching, taking, or harvesting of fish." Data for other passenger vessels are obtained from the Coast Guard's Marine Safety Information System Database, and are considered noncruise passenger vessels.

**Table 12-2**  
**Vehicle-Kilometers by Mode**

**Canada**

Table 12-2 is based on the following primary sources:

Road: Transport Canada. *Transportation in Canada 1997—Annual Report*. (Ottawa, Ont.: 1998).

Transport Canada. Economic Analysis Directorate. (Ottawa, Ont.: 1998).

Rail: Statistics Canada. *Rail in Canada, Catalogue 52-216-XPB*. (Ottawa, Ont.: various years).

Bus: Statistics Canada. *Passenger Bus and Urban Transit Statistics, Catalogue 53-215-XPB*. (Ottawa, Ont.: various years).

Domestic aircraft-kilometers for Canadian Level I to Level IV air carriers were last reported in 1987. Road vehicle-kilometers for personal vehicles and commercial freight vehicles (but not for bus) are based on a Transport Canada estimate for 1995 of the numbers of vehicle kilometers traveled by passenger motor vehicles, light trucks and commercial freight vehicles. Estimates of vehicle-kilometers are calculated based on: (1) road motor vehicle fuel sales (net sales on which taxes were paid at road-use rates); and (2) estimates of fuel efficiency by class of vehicle. Domestic intercity passenger rail kilometers include Class I and II services. All bus data are from a sample of Canadian companies engaged in scheduled intercity bus, urban transit, school bus and charter and other types of bus service from Statistics Canada's annual *Survey of the Passenger Bus and Urban Transit Industry*.

**Mexico**

Air: Secretaría de Comunicaciones y Transportes. Dirección General de Aeronáutica Civil. (Mexico City, D.F.: 1998).

Rail: Ferrocarriles Nacionales de México. *Series Estadísticas, 1990, 1995 and 1996*. (Mexico City, D.F.: various years).

Air data include only kilometers traveled by national lines under scheduled operation in domestic and international service. Rail data include vehicle activity by the entire railroad system, which during the years 1990, 1995 and 1996 was operated by one company.

**United States**

Table 12-2 is based on the following primary sources:

Air carrier: U.S. Department of Transportation. Bureau of Transportation Statistics. Office of Airline Information. *Air Carrier Traffic Statistics*. (Washington, DC: 1986-1997). Page 2, Line 27, plus Line 50.

General aviation: U.S. Department of Transportation. Federal Aviation Administration. *General Aviation and Air Taxi Activity (and Avionics) Survey*. (Washington, DC: 1990, 1995 and 1996). Table 3.3. Web site: [api.hq.faa.gov/ga96/gatoc.htm](http://api.hq.faa.gov/ga96/gatoc.htm)

Road:

1990, 1995: U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, Summary to 1995*. (Washington, DC: 1996). Table VM-201A.

1996: U.S. Department of Transportation. Federal Highway Administration. *Highway Statistics, 1996*. (Washington, DC: 1997). Table VM-1.

Local motor bus: American Public Transit Association (APTA). *Transit Fact Book 1996*. (Washington, DC: 1996).

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Transit: American Public Transit Association. *Transit Fact Book 1996*. (Washington, DC: 1996).

Freight rail: Association of American Railroads. *Railroad Facts*. (Washington, DC: 1997). Page 33.

Intercity passenger rail: National Railroad Passenger Corp. *Amtrak Annual Report 1996*. (Washington, DC: 1996). Statistical Abstract.

National Railroad Passenger Corp. State and Local Affairs Department and Public Affairs Department. Private communication. (Washington, DC: 1998).

Air: Air total includes data for domestic air carriers and general aviation. Air data for domestic air carrier vehicle-kilometers in the United States are based on 100 percent reporting of passengers and trip length by some 90 large certificated air carriers (including the medium regional carriers) that operate aircraft with a passenger seating capacity of more than 60, or have a payload capacity of more than 8,165 kilograms, or operate internationally. (For additional information on the definition of large certificated air carrier, see the technical notes for Table 4-2). The figures do not include data for all airlines; most notably, small certificated air carriers, scheduled commuter airlines and on-demand air taxis are excluded. If added, these might raise the totals by roughly 13 percent in 1995. In this table, general aviation includes on-demand air taxis, corporate flying, sightseeing and personal flying and some other forms of flying but excludes military flying. Vehicle miles are estimates derived from the Federal Aviation Administration's *General Aviation and Air Taxi Activity Survey*.

Road: Road data include passenger cars, motorcycles and light trucks. Passenger cars include taxis. Road data are based on statistics compiled by the Federal Highway Administration (FHWA) at the U.S. Department of Transportation from reports by the states. In 1995, the U.S. Department of Transportation, Federal Highway Administration (FHWA) revised its vehicle type categories for data from 1993 and later. The new categories include passenger car, the FHWA category "other 2-axle, 4-tire vehicles" (called "light truck" in this table), single unit trucks ("single-unit 2-axle 6-tire or more truck") and combination trucks. Pre-1993 data were assigned to the closest available category. Data for light trucks include vans, pick-up trucks and sport/utility vehicles. Single-unit trucks are on a single frame with at least two axles and six tires, and correspond to the category of single-unit trucks in Table 12-2. Combination truck tractors correspond to the category of tractors in Table 12-2. In January 1997, the FHWA published revised vehicle-kilometers data for the highway mode for several years. The major change reflected the reassignment of some vehicles from the passenger car category to the light truck category. Bus totals are based on data from the FHWA and include charter, intercity, local motor bus and school bus. Local motor bus data are based on data from a private association. (See below for a description.)

Transit: Transit data are from the American Public Transit Association (APTA) and are based on information in the Federal Transit Administration's (FTA) National Transit Database. APTA conservatively adjusts the FTA data to include transit operators that do not report to this database. These nonreporting



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operators typically include private, very small and/or rural operators. There are about 6,000 transit operators in the U.S., according to APTA—about 1,000 of these report to FTA. However, these 1,000 operators account for approximately 90 to 95 percent of the total transit passenger-kilometers. Reliability of the U.S. transit data varies by mode. The numbers for rail are the most comprehensive; those for bus are less so because there are so many more operators. Transit total includes other U.S. transit categories not individually specified here, including local motor bus, trolley bus, ferries and transit for the disabled. Transit rail includes commuter rail, heavy rail and light rail and is based on car-kilometers.

*Rail:* Rail freight train-kilometers are based on Class I railroads in the United States. Class I railroads had annual gross operating revenues in approximate excess of \$250 million (based on 1991 dollars) and comprised only 2 percent of the railroads in the U.S., but accounted for about 70 percent of the industry's distance operated, 90 percent of its employees and 90 percent of its freight revenues. Train-kilometers are based on the distance run between terminals and/or stations.

